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COVER PHOTO

KOREAN CLOSEUP—Two American soldiers are pictured as they prepare to fire a 3.5" rocket launcher on the Korean front lines. (U. S. Army photo.)

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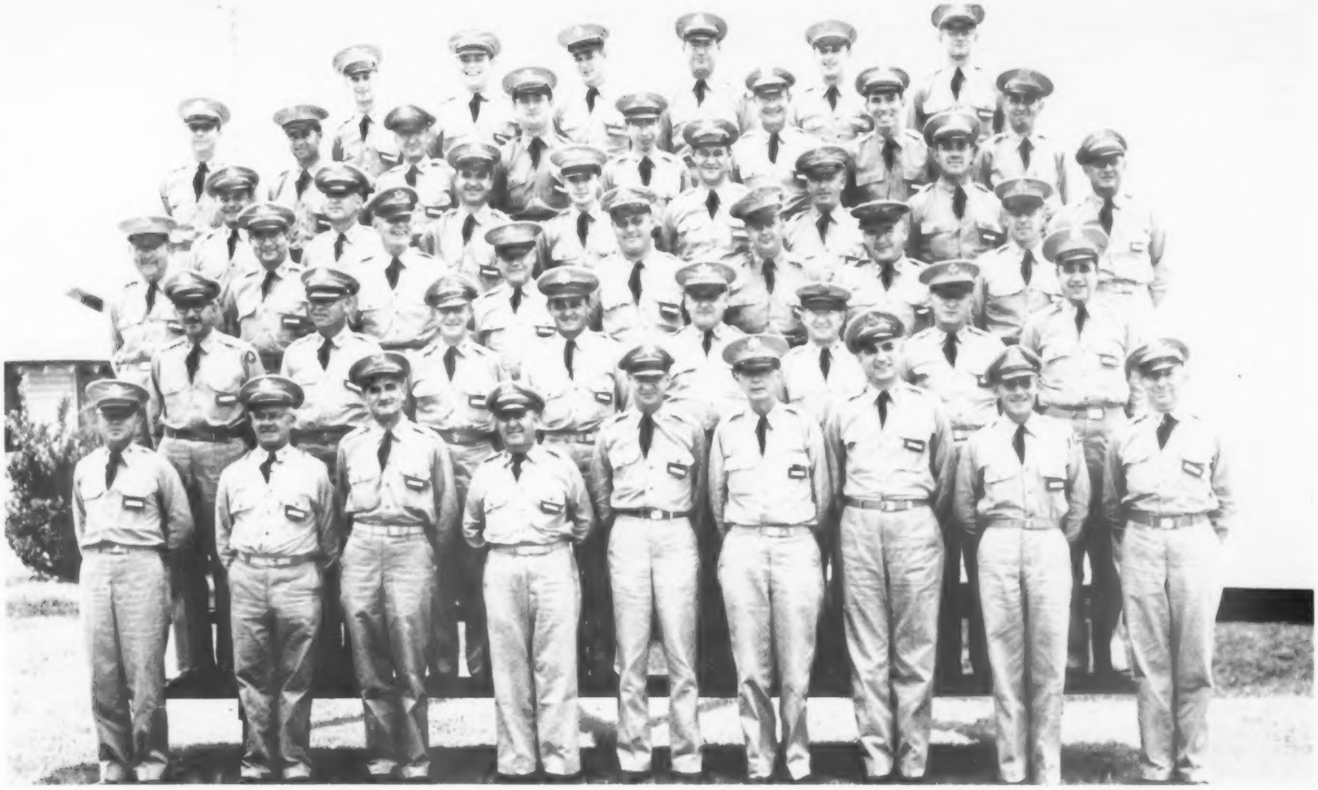


RESERVE CHEMICAL SCHOOL SETS RECORD—The Third Army Area Chemical School, held 13-27 August at Fort Benning, Ga., set a new attendance record, with 47 officers in attendance. This was more than twice the size of the 1949 school. Those shown in the picture are, left to right, First Row: Col. W. W. Stevens, Col. M. M. Walding, Col. E. L. Shepherd, Col. F. E. Powell, Lt. Col. R. G. Harris, Lt. Col. C. N. Wilder, Lt. Col. J. W. Duckett, Maj. J. R. Williams, 1st Lt. John W. Pittman; Second Row: Lt. Col. C. C. Sullivan, Lt. Col. C. W. Price, Lt. Col. R. A. Burton, Lt. Col. W. E. Sansbury, Lt. Col. L. A. Klauber, Lt. Col. J. C. Morcock, Lt. Col. C. C. Templeton, Lt. Col. C. J. Chunn; Third Row: Lt. Col. R. H. Elder, Lt. Col. G. E. Motz, Lt. Col. J. C. Lowery, Lt. Col. W. H. Lemmond, Maj. C. W. Carnes, Maj. G. Fernau, Maj. J. A. Southern, Maj. H. C. Little; Fourth Row: Maj. G. McLaughlin, Maj. W. R. Johnson, Maj. W. T. Harper, Maj. J. P. Padgett, Maj. L. Farrell, Maj. C. C. Siegling, Maj. B. T. Horton, Capt. M. Robbins; Fifth Row: Capt. R. M. Langley, Capt. J. E. Gilbert, Capt. C. L. Clark, Capt. M. D. Martin, Capt. T. H. Guion, Capt. P. E. Stone, Capt. W. W. Dunn, Capt. G. A. Hawkins; Sixth Row: 1st Lt. D. Wetherhorn, 2nd Lt. J. A. Ellard, 2nd Lt. T. D. Cantrell, 2nd Lt. J. C. Long, 2nd Lt. G. A. Yount, 2nd Lt. W. H. Finley.

NEW MODIFICATIONS OF THE OXO PROCESS

By

★ IRVING WENDER ★ MILTON ORCHIN ★ H. H. STORCH

The oxo reaction was developed in Germany in the course of research on the Fischer-Tropsch synthesis for the production of liquid fuels and chemicals from carbon monoxide and hydrogen. The reaction consists of the treatment of an olefin with synthesis gas in the presence of a cobalt catalyst to produce aldehydes containing one carbon atom more than the starting compound:

$$RCH{=}CH_2 + CO + H_2 \longrightarrow \begin{cases} R(CH_2)_2CHO \\ RCH(CHO){-}CH_3 \end{cases}$$

The aldehydes were usually reduced to alcohols in a separate stage, using pure hydrogen. The voluminous German literature on the oxo reaction has been abstracted and summarized in numerous publications. Possible explanations for the special catalytic effect of cobalt in the oxo reaction and introductory ideas concerning the mechanism of the reaction are contained in a Bureau of Mines report.[3] The present article is concerned with post-war developments of the oxo reaction.

Direction of Addition in the Oxo Reaction

The German workers reported that the hydroformylation of dodecene-1 gave rise to a mixture of alcohols having the following compositions: 40 percent normal C_{13} alcohol and 60 percent branched alcohols. In general, the same ratio of normal to branched alcohols was reported from all straight-chain terminal olefins having more than two carbon atoms. Apart from a remark that, due to steric hindrance, isoamyl alcohol is the only alcohol obtained from isobutene, little further information with regard to the structure of the hydroformylation products was available at the end of World War II.

In 1948, Keulemans, Kwantes, and Van Bavel examined critically the hydroformylation of a number of pure olefins up to eight carbon atoms in an attempt to predict the structure of the aldehydes (or alcohols) secured from a given olefin. The work is excellent and timely; any mechanism proposed for the oxo reaction should be able to account for the products obtained from different olefins. Their results are reproduced in Table 1.

It is revealing to study the products of the hydroformylation of 2-methylbutene-2. If no isomerization of the double bond occurs, the products expected would be 2,2-dimethylbutanol-1 (I) and 2,3-dimethylbutanol-(II). The product contained none of I and only a trace of II.

Table I.

Products obtained by Hydroformylation of pure olefins.

Olefin	Alcohols obtained, percent
Propene	60 n-butanol 40 2-methyl-propanol-1
Butene-1	50 n-butanol 50 2-methyl-butanol-1
Butene-2	50 n-pentanol 50 2-methyl-butanol-1
Isobuten	3-methyl-butanol-1 only
Pentene-1	50 n-hexanol 40 2-methyl-pentanol-1 10 2-ethyl-butanol-1
Pentene-2	55 n-hexanol 35 2-methyl-pentanol-1 10 2-ethyl-butanol-1
2-Methyl-butene-1 2-Methyl-butene-2 3-Methyl-butene-1	55 4-methyl-pentanol-1 45 3-methyl-pentanol-1 5 2,3-dimethyl-butanol-1 from each of the 3 isopentenes
n-hexene-1	50 n-heptanol 30 2-methyl-hexanol-1 20 2-ethyl-pentanol-1
2-Methyl-pentene-3	30 2,4-dimethyl-pentanol 40 5-methyl-hexanol-1 30 3-methyl-hexanol-1
2,3-Dimethyl-butene-1 2,3-Dimethyl-butene-2 3,3-Dimethyl-butene-1	3,4-dimethyl-pentanol-1 only 4,4-dimethyl-pentanol-1 only
2,4,4-Trimethyl-pentene-1 2,4,4-Trimethyl-pentene-2	3,5,5-trimethyl-hexanol-1 only
Cyclopentene	Cyclopentyl carbinol
Cyclohexene	Cyclohexyl carbinol

The equilibrium concentrations of the three isopentenes at the hydroformylation temperature is

2-methylbutene-1	10 percent
3-methylbutene-1	8 percent
2-methylbutene-2	73 percent

Although the isomer with the most favored structure, 2-methylbutene-2, was used as the starting material, virtually no product derived from this olefin was found. A mixture of 3-methylpentanol-1 (from 2-methylbutene-1) and 4-methylpentanol-1 (from 3-methylbutene-1) was the chief product. Thus, a shift of the double bond may occur during hydroformylation, even though the olefin under

* Mr. Wender and Mr. Orchin are organic chemists with the Research and Development Branch, Office of Synthetic Liquid Fuels, Bureau of Mines, Bruceton, Pa. Mr. Storch is Chief, Research and Development Branch, of that agency.

consideration is stable from a thermodynamic point of view.

Keulemans, et. al., drew the following conclusions from their experiments:

1. From straight-chain olefins a mixture of alcohols is obtained containing 40-60 percent straight-chain primary alcohols and 60-40 percent A-alkyl branched primary alcohols.
2. Addition of a formyl group to a tertiary C atom does not occur at all. No quaternary C atoms are formed.
3. Addition of a formyl group adjacent to a tertiary C atom is strongly hindered, but may yet occur to a small extent.
4. Addition of a formyl group adjacent to a quaternary C atom does not occur.
5. Addition of a formyl group is not hindered by an isolated tertiary C atom.
6. Isomorization of the double bond generally accompanies the formylation, but does not necessarily occur.

Hydrogenation Under Oxo Reaction Conditions

In studying the products of the oxo reaction on various unsaturated compounds, Adkins and Krsek found that A, B-unsaturated aldehydes and ketones do not undergo the hydroformylation (oxo) reaction but instead are reduced to the saturated carbonyl compound. Workers at the Bureau of Mines found that, if the reaction is conducted at 180°-190°C., the carbonyl group as well as the double bond is reduced and the reduction under these conditions was found to be a general reaction. Crotonaldehyde, which Adkins and Krsek had converted to butyraldehyde at 120°-125°C., was hydrogenated by the workers at the Bureau of Mines directly to butanol-1 at 180°-185°C. Heptaldehyde, butyraldehyde, and 2-phenylpropionaldehyde was reduced in good yields to their corresponding alcohols. Acetone could likewise be reduced to isopropyl alcohol at 185°-190°C.

Since carbonyl compounds are reduced in the presence of synthesis gas and a cobalt catalyst at 180°-190°C., it was anticipated that olefins could be converted directly to alcohols in the oxo reaction. It was found that hexene-1 reacted with carbon monoxide and hydrogen at 160°-180°C. to give a 43 percent yield of a mixture of heptanol-1 and 2-methylhexanol-1. Octene-1 reacted similarly to give a mixture of isomeric nonyl alcohols (60 percent). The one-step synthesis of alcohols from olefins in the oxo reaction is therefore entirely feasible.

Although an alcohol can be produced directly from an olefin in the oxo reaction at 185°, if the reaction is conducted at lower partial pressures, the aldehyde can be isolated as the major product. Thus, for example, when octene-1 was treated with synthesis gas at 875 p.s.i. initial pressure, 13 percent of the octene reacted to give a mixture of nonyl aldehydes (83 percent) and nonyl alcohols (17 percent). Under essentially the same conditions but at 3,000 p.s.i., a mixture of nonyl alcohols was obtained practically free of aldehydes.

It seems rather strange for a hydrogenation reaction catalyzed by cobalt to occur in the presence of large amounts of carbon monoxide. Ordinarily, carbon monoxide must be absent for nickel to function as a hydrogenation catalyst. In the oxo process itself, the aldehydes formed cannot be hydrogenated in the second stage unless traces of carbon monoxide are removed by a pretreatment with pure hydrogen. However, the above work shows that hydrogenations in the presence of a cobalt catalyst and large amounts of carbon monoxide proceed rapidly and in good yield.

For hydrogenation to occur, energy must be supplied to break the bond in the hydrogen molecule. In heterogeneous catalysis, the surface of the catalyst is involved in the dissociation of hydrogen molecules. The reductions that occur under oxo conditions are probably homogeneously catalyzed; the dissociation of the hydrogen molecule may occur in the formation of cobalt hydrocarbonyl from dicobalt octacarbonyl according to the equation:

$$[Co(CO)_4]_2 + H_2 \rightleftharpoons 2\, HCo(CO)_4.$$

Both dicobalt octacarbonyl and cobalt hydrocarbonyl have been identified in the products of the reaction. It is also possible that the hydrocarbonyl is formed directly from cobalt, carbon monoxide, and hydrogen.

$$Co + 4CO + \tfrac{1}{2}\, H_2 \rightleftharpoons HCo(CO)_4$$

A series of experiments was designed by Wender, Orchin, and Storch to show that these hydrogenations are homogeneous with the soluble dicobalt octacarbonyl or cobalt hydrocarbonyl functioning as the catalyst. In a first experiment, reduced cobalt metal was prepared by treatment of cobalt formate in cyclohexane suspension at 180° and 2,000 p.s.i. (initial) hydrogen pressure. Butyraldehyde was added to the mixture and hydrogenated at 185° with 2,000 p.s.i of hydrogen. The hydrogenation went smoothly; the calculated pressure drop was observed and butanol-1 was isolated as the product. In a second experiment, cobalt metal was prepared as above and the reduction of butyraldehyde achieved with synthesis gas (2,000 p.s.i of hydrogen and 1,000 p.s.i. of carbon monoxide). In this case, the reaction was presumably homogeneous with the soluble dicobalt octacarbonyl functioning as the catalyst.

In a third experiment, freshly reduced cobalt metal was prepared as above; butyraldehyde was added and treated with a gas mixture containing 300 p.s.i. of carbon monoxide and 2,000 p.s.i. of hydrogen. No reaction occurred. Presumably, sufficient carbon monoxide was present to poison the cobalt for heterogeneous catalysis which could be successfully conducted in the absence of carbon monoxide (first experiment), but insufficient carbon monoxide was present to prevent the formation of dicobalt octacarbonyl which was a successful catalyst in the second experiment. In a concluding experiment, butyraldehyde was treated with a clear solution of dicobalt octacarbonyl at 185° and 2,000 p.s.i. of hydrogen. No hydrogenation occurred; the cobalt was reduced to metallic cobalt which could not function as a catalyst because of the poisoning effect of carbon monoxide in the system.

These experiments indicate quite strongly that hydrogenation reactions which occur in the presence of cobalt and a high partial pressure of carbon monoxide proceed by homogeneous catalysis in which dicobalt octacarbonyl functions as the catalyst.

It is possible that the reductions which occur under oxo conditions proceed via a free radical mechanism. Either dicobalt octacarbonyl or cobalt hydrocarbonyl, which are formed from cobalt salts in the presence of synthesis gas, may dissociate into free radicals which function as initiators for the dissociation of hydrogen molecules into atoms. One way in which the free radical reduction of carbonyl compounds with synthesis gas and cobalt catalyst can be written is as follows:

(a) $2Co + 8CO \rightleftharpoons [Co(CO)_4]_2$

(b) $[Co(CO)_4]_2 \rightleftharpoons 2 .Co(CO)_4$

(c) $.Co(CO)_4 + H_2 \rightleftharpoons H. + HCo(CO)_4$

(d) $H. + RCHO \rightleftharpoons R\underset{\cdot}{C}HOH$

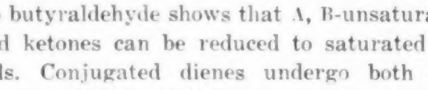
(e) $R\underset{\cdot}{C}HOH + HCo(CO)_4 \rightleftharpoons RCH_2OH + .Co(CO)_4$

Step (c) may then be repeated and the chain continued until all the aldehyde is converted to alcohol.

If the reduction is a homogeneous reaction that proceeds via a free radical mechanism, hydrogenation under these conditions should not be adversely affected by sulfur compounds as is the heterogeneous catalysis of hydrogenation over a solid catalyst. Indeed, it was found that 2-thiophenecarboxaldehyde, when treated with synthesis gas at 180°-185°C., was readily reduced in good yield to a mixture of 2-thenyl alcohol (41 percent) and 2-methylthiophene (26 percent).

Since the catalyst for these hydrogenations is easy to prepare and the hydrogenation itself is not affected by the usual poisons encountered in heterogeneous catalysis, this method of reduction offers attractive avenues for further investigation.

Under the conditions of the oxo reaction, some types of unsaturated linkages are hydrogenated while others react by hydroformylation. The type of reaction which occurs depends, among other things, on the structure of the particular unsaturated compound. Simple olefins react by hydroformylation to give an aldehyde containing one atom more than the olefin. The hydrogenation of crotonaldehyde to butyraldehyde shows that A, B-unsaturated aldehydes and ketones can be reduced to saturated carbonyl compounds. Conjugated dienes undergo both types of reaction; one olefinic linkage is usually hydrogenated while hydroformylation takes place at the other. Thus, 1,3-butadiene gives n-valeraldehyde and 2,3-dimethylbutadiene-1,3 gives 3,4-dimethylpentanal. Furan, which may be considered a heterocyclic conjugated diene, reacts with synthesis gas at 160°-180° to give tetrahydrofurfuryl alcohol.[7] Similar treatment of



2,5-dimethyfuran gives 2,5-dimethyl-3-tetrahydrofurfuryl alcohol. In these cases, as with butadiene, both hydrogenation and hydroformylation occur. Thiophene, which is more aromatic than furan, does not undergo the hydroformylation reaction; instead, it is slowly hydrogenated to thiolane. Phenanthrene is slowly hydrogenated in the presence of synthesis gas; 9,10-dihydrophenanthrene and 1,2,3,4-tetrahydrophenanthrene have been identified in the products of the reaction. Benzene, of course, does not undergo the ordinary oxo reaction nor is it reduced at 185°-190°C. in the presence of synthesis gas. These results agree with the generally accepted order of aromaticity of these systems and furnish some idea of the degree of double bond character necessary for the oxo reaction and the hydrogenation to occur.

The reaction of furan is of particular interest. It is probable that hydrogen saturates one double bond and that an oxo reaction then occurs at the remaining (now olefinic) bond. The resulting aldehyde is then reduced. This addition of 4 moles of gas occurs rapidly and opens up a new field of study in the chemistry of furan and its derivatives. It is possible that furfural will yield a chain of six carbon atoms, useful in the synthesis of adipic acid.

Some of the reactions described above and the conditions under which they took place are summarized in Table 2. Most of these reactions were run only once and no attempts to obtain the maximum yields possible were made.

TABLE 2.—*Reactions of some organic compounds with synthesis gas and a cobalt catalyst at 180°-185°C.*[a]

Starting compound	Synthesis gas, H_2:CO	Initial pressure, p.s.i.	Time, hours	Products	Yield, percent
Butyraldehyde	2:1	3100	1	Butanol-1	72
Heptaldehyde	1:1	3000	1	Heptanol-1	3[illegible]
2-Phenylpropion-aldehyde	1:4	2000	3	2-Phenylpropionaldehyde	1[illegible]
				2-Phenylpropanol-1	38
Acetone	1:1	3000	4.5	Acetone	4[illegible]
Crotonaldehyde	1:1	3200	0.5	Isopropyl alcohol	41
2-Thiophene-carboxaldehyde	1:1	2300	0.8	Butanol-1	3[illegible]
				2-Thiophenecarboxaldehyde	17
				2-Thenyl alcohol	41
Furan	2:1	3100	4	2-Methylthiophene	26
2, 5-Dimethylfuran	2:1	3000	4	2-Tetrahydrofurfuryl alcohol	3[illegible]
				2, 5-Dimethyl-3-tetra-hydrofurfuryl alcohol	2[illegible]
Thiophene	2:1	3200	8		
				Thiophene	86
Phenanthrene	2:1	2700	2	Thiolane	8
				Phenanthrene	81
				9, 10-Dihydrophenanthrene	7
				1, 2, 3, 4-Tetrahydro-phenanthrene	1
Hexene-1	1:1	3000	3		
				2-Methylhexanol-1	17
Octene-1	1:1	3000	3.5	Heptanol-1	29
Octene-1	1:1	3000	3.5	Isomeric nonyl alcohols	61
Octene-1	1:1	875	1.5	Isomeric nonyl alcohols	57
				Isomeric nonyl aldehydes	1[illegible]

[a] See reference 7.

The Homologation of Aliphatic Alcohols

It has been postulated that the oxo reaction may proceed in whole or in part through the formation of an intermediate carbonium ion formed by the addition of a proton (from cobalt hydrocarbonyl) to the olefin.[2] If a carbonium ion is actually an intermediate in the oxo reaction, then other compounds besides olefins which can form carbonium ions under oxo reaction conditions should undergo a series of reactions similar to that encountered when olefins are subjected to the hydroformylation reaction. In this manner, an alcohol containing one more carbon atom than the starting compound should be produced.

Workers at the Bureau of Mines have found, indeed, that alcohols are converted to the primary alcohol containing one carbon atom more than the original when treated with a cobalt catalyst and synthesis gas at 185°-190°C. This homologation is a general reaction applicable to tertiary, secondary, and primary aliphatic alcohols. It should be pointed out, however, that this does not prove that the oxo reaction with olefins proceeds via a carbonium ion, although evidence is mounting that the homologation may proceed through such an intermediate.

Tertiary butyl alcohol reacts rapidly at 160°-180°C. to give isoamyl alcohol in good yield (75 percent). There is little doubt that this reaction involves the dehydration of the tertiary butyl alcohol to isobutylene followed by an oxo reaction on the olefin. Isobutylene was identified in the tail gas of this reaction. If the reaction is conducted at 140°-150°, the chief product is isovaleraldehyde.

Isopropyl alcohol reacts much more slowly under oxo conditions to give an 11 percent yield of a mixture of isobutyl and n-butyl alcohols. The isopropyl carbonium ion can react with carbon monoxide and hydrogen to form isobutyl alcohol. The same ion can lose a proton to form propylene which can then undergo the oxo reaction to yield both isobutyl and n-butyl alcohols. The presence of n-butyl alcohol in the products of this reaction therefore is evidence that at least part of the isopropyl alcohol was dehydrated to propylene.

N-propyl alcohol reacts very slowly under oxo conditions to give a 6 percent yield of a mixture of n-butyl and isobutyl alcohols. Traces of alcohols containing five carbon atoms were also present in the reaction products.

It is interesting to note that the rates of reactions and yields of homologated alcohols obtained are consistent with the stability and ease of formation of the postulated intermediate carbonium ions. The general order of reactivity of various alcohols in the homologation reactions is tertiary secondary primary.

It has been found, however, that the simplest primary alcohol, methyl alcohol, is anomalous in that it reacts with synthesis gas more rapidly than secondary alcohols. In one experiment, using a small Aminco autoclave, methyl alcohol was treated at 185° with an equimolar mixture of carbon monoxide and hydrogen in the presence of dicobalt octacarbonyl. Seventy-six percent of the methyl alcohol reacted to give a 39 percent yield of ethanol, the major product of the reaction. This conversion presents an interesting new route to ethanol which may have important theoretical and commercial implications. The interest in the reaction from a mechanism point of view stems from the fact that it is impossible for methanol to react via an olefin intermediate. It appears, therefore, that an olefin is not necessary as an intermediate in the homologation reaction.

Hydrogenation and Homologation of Aromatic Aldehydes, Ketones, and Alcohols

Aromatic aldehydes and ketones, unlike aliphatic carbonyl compounds, are reduced to hydrocarbons when heated at 180°-185° with synthesis gas and a cobalt catalyst. It is likely that the reduction occurs in a stepwise manner, with the aromatic carbonyl compound reduced first to the alcohol followed by reduction of the alcohol to the hydrocarbon. The ready reduction of aromatic alcohols to hydrocarbons and the occasional isolation of the intermediate alcohol support this view.

Benzyl alcohol reacts rapidly with synthesis gas at 185° in the presence of a cobalt catalyst to yield toluene (55 percent) and the homologous alcohol, 2-phenylethanol. The latter cannot be formed through an intermediate olefin since there is no hydrogen available on the A-carbon atom. Although benzyl alcohol is a primary alcohol, it reacts at a much faster rate than the ordinary aliphatic alcohol; this is consistent with the postulation that a carbonium ion is an intermediate in the homologation reaction. The fact that the benzyl carbonium is resonance stabilized may account for the rate at which benzyl alcohol reacts under oxo conditions.

The reactions of a few aromatic aldehydes, ketones and alcohols under oxo conditions are summarized in Table 3.

TABLE 3.—*Reaction of aromatic aldehydes, ketones, and alcohols with synthesis gas and a cobalt catalyst at 185°C.*

Starting compound	Hydrocarbon	Percent	Others	Percent
Benzyl alcohol	Toluene	55	2-Phenylethanol-1	26
Acetophenone	Ethylbenzene	62	—	—
Fluorenone	Fluorene	95	9-Fluorenol	2
Benzophenone	Diphenylmethane	86	Benzophenone	6
Benzhydrol	Diphenylmethane	95	—	—
Triphenylcarbinol	Triphenylmethane	94	—	—
Benzopinacol	Diphenylmethane	89	Benzophenone	5
Benzanthrone	1, 10-Trimethylene-phenanthrene	59	—	—

The hydrogenation of aromatic ketones and aldehydes probably occurs by the mechanism previously proposed for the reduction of aliphatic carbonyl compounds. The aromatic alcohol which is then formed may react further to give a hydrocarbon in the following manner:

$$C_6H_5CH_2OH + H\cdot \rightleftharpoons C_6H_5CH_2\cdot + H_2O$$
$$C_6H_5CH_2\cdot + HCo(CO)_4 \rightleftharpoons C_6H_5CH_3 + \cdot Co(CO)_4$$

As the number of phenyl groups attached to the oxygenated carbon atom is increased, the yield of hydrocarbon becomes very high. The driving force in these reactions is probably the low energy requirement of the intermediate free radical which is resonance stabilized by the phenyl groups attached to the carbon atom involved in the reaction. The energy necessary to break the carbon-oxygen bond in triphenylcarbinol, for instance, is less than the energy required to break the carbon-oxygen bond in benzyl alcohol and considerably less than that needed to break the same bond in ethanol.

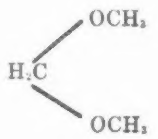
Application To Organic Syntheses

The oxo reaction was developed in the course of research on the Fischer-Tropsch synthesis for the production of liquid fuels and chemicals from carbon monoxide and hydrogen. Roelen, who was responsible for the rapid utilization of the oxo reaction in Germany, predicted that this reaction might some day find extensive use in the synthesis of organic compounds. The new modifications and extensions of the oxo process suggest that this prediction will be fulfilled, perhaps more rapidly and with wider application than Roelen had anticipated.

At this point, mention should be made of two recently discovered reactions which take place under oxo conditions. Formaldehyde, instead of being reduced to methyl alcohol, reacts with synthesis gas to yield ethylene glycol:[12]

$$HCHO + 2H_2 + CO \rightarrow HOCH_2CH_2OH.$$

this method may be an alternate procedure for the preparation of ethylene glycol which is now prepared via the reaction of formaldehyde with carbon monoxide and water in the presence of an acid. The second of these new reactions involves the treatment of methylal, the dimethyl acetal of formaldehyde, with synthesis gas and a cobalt catalyst to yield the industrially useful methyl cellosolve, the monomethyl ether of ethylene glycol:



$$+2H_2 + CO \rightarrow HOCH_2CH_2OCH_3 + CH_3OH.$$

The reductions possible at 180°-190° have already been pointed out. Large scale use of this reaction for the reduction of compounds containing sulfur is a possibility.

It is fairly obvious that the synthesis of ethanol from coal or natural gas is now possible, although the commercial utilization of the "ethanol from methanol" reaction herein reported is far from realization. The route would be coal or natural gas→synthesis gas→methanol →ethanol. While the United States can probably utilize existing methods and plants to ease the current ethanol shortage, many other countries may turn to this homologation reaction to satisfy their alcohol needs. England, for instance, lacks the raw materials for the manufacture of ethyl alcohol by fermentation or by ethylene hydration and has been probing the possibility of getting ethyl alcohol from the Fischer-Tropsch reaction. Since large amounts of methanol can be synthesized easily from coal, foreign utilization of this reaction may be forthcoming within a reasonably short time.

The yield of ethanol from methanol can probably be increased by increasing the hydrogen to carbon monoxide ratio of the synthesis gas. A small continuous unit

[12] Gresham and Brooks, U. S. Patent 2,451,333.

has been constructed at the Bureau of Mines for further studies of this unusual reaction.

Distillation of the products of the homologation of benzyl alcohol yields 2-phenylethanol in high purity. This chemical is used as the basic ingredient of many perfumes. Preliminary experiments have revealed that the yield of 2-phenylethanol from benzyl alcohol may be somewhat increased by using higher hydrogen-to-carbon monoxide ratios. The reactions of benzyl alcohol and substituted benzyl alcohols with synthesis gas are being investigated by several laboratories.

It was the hope of early workers in the field that adipic acid for nylon manufacture could be synthesized via an oxo reaction on butadiene. However, hydrogen adds across one double bond and the main product is a mono-aldehyde, n-valeraldehyde. A study of the mechanism of the homologation reaction may furnish a method for carrying out the synthesis of adipic acid via a modified oxo reaction.

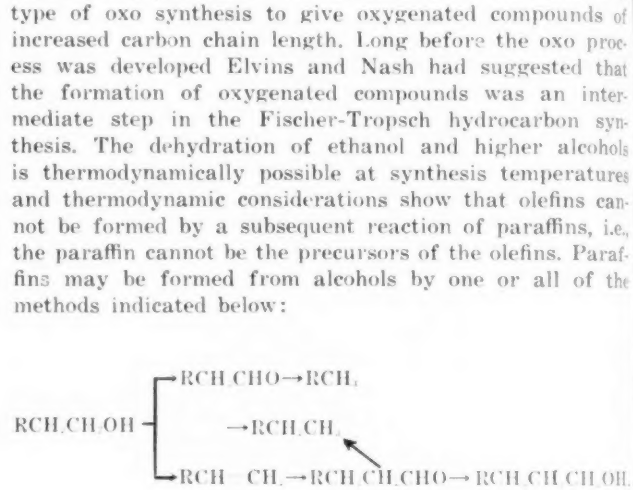
Research is needed on methods for controlling addition across the double bond in the oxo reaction. Very often, only one of the two isomers secured is of industrial importance; straight chain alcohols, for example, make better detergents than branched-chain alcohols. Preliminary work has revealed that addition across the double bond can be controlled, to some extent, by adjusting reaction conditions. Occasionally, if one isomeric aldehyde is more reactive than the other, it may be made to react further, by aldolization or polymerization, while the less reactive aldehyde is not affected. A concentration of the desired product is thus achieved.

Relation of the Oxo and Similar Reactions to the Fischer-Tropsch Reaction

The oxo reaction was discovered in the course of research on the Fischer-Tropsch process and it is likely that a knowledge of the mechanism of the oxo reaction will shed light on the mechanism of the parent process. Fischer and Tropsch postulated that the synthesis of hydrocarbons from carbon monoxide and hydrogen proceeded through the formation of an intermediate metal carbide. The carbide was presumably hydrogenated to methylene groups which polymerized to form hydrocarbon chains that desorbed from the catalyst surface as saturated and unsaturated hydrocarbons. Although this postulation stimulated a great deal of research, recent work using radioactive carbon[14] and studies on cobalt carbide[15] have shown that this theory probably is untenable. The carbide intermediate theory cannot account for the reaction products from a cobalt catalyst and cannot explain the major products from an iron catalyst.

A careful analysis of the products from Fischer-Tropsch reactions has been made at the Bureau of Mines and the possible bearing this may have on the mechanism have recently been published. The detailed product analysis was made possible by employing the newer analytical techniques of mass spectrometry, infrared analysis and chromatography. By means of a mass spectrometric analysis of the isomer distribution from a Fischer-Tropsch reaction over cobalt in each of the molecular weight cuts from C_5 to C_8 it was possible to show that the isomer distribution could be deduced from probability considerations if a few assumptions were granted. These assumptions were: (1) the carbon skeleton is built up by the step-wise addition of one carbon atom at a time. (2) Addition of the carbon atom occurs only at the terminal or next to the terminal carbon atom of the chain and does not occur at a tertiary carbon atom to form a product containing a quaternary carbon atom. These assumptions, of course, were made necessary so as to comply with the knowledge of product distribution determined experimentally. It is of interest to note that these two assumptions are facts as regards the oxo synthesis; chain lengthening occurs by the addition of one carbon atom at a time and the addition does not occur to a carbon which lacks a hydrogen atom; e.g., isobutene gives only isovaleraldehyde.

It has been suggested that the Fischer-Tropsch reaction is partly a combination of the synol* and oxo process in which alcohols are first formed as intermediates and then are dehydrated to olefins, some of which react in a type of oxo synthesis to give oxygenated compounds of increased carbon chain length. Long before the oxo process was developed Elvins and Nash had suggested that the formation of oxygenated compounds was an intermediate step in the Fischer-Tropsch hydrocarbon synthesis. The dehydration of ethanol and higher alcohols is thermodynamically possible at synthesis temperatures and thermodynamic considerations show that olefins cannot be formed by a subsequent reaction of paraffins, i.e., the paraffin cannot be the precursors of the olefins. Paraffins may be formed from alcohols by one or all of the methods indicated below:



Most of these schemes have been shown to be feasible even in the presence of high partial pressures of carbon monoxide and hydrogen.

It is interesting to note that the variety and distribution of products obtained from methyl alcohol in the homologation reaction have certain similarities to the oxygenated products secured in the Fischer-Tropsch process. Ethanol is the chief oxygenated product from the Fischer-Tropsch reaction and relatively small quantities of methyl, propyl, and butyl alcohols are found. The preponderance of ethanol and the relative small amounts of methanol, n-propanol, and butanols in the Fischer-Tropsch process products may be significant in comparison with the rapid conversion of methanol and the slow reaction of ethanol which are characteristic of the homologation reaction. Ethanol may react in the Fischer-Tropsch process by homologation or may dehydrate to form ethylene.

The relatively very low concentration of ethylene in Fischer-Tropsch products and the results of experiments in which ethylene is added to the synthesis gas indicate that some mechanism consumes this olefin rapidly. The unique position of ethylene in the synthesis may be due to the fact that it is the first member of the olefin series and probably reacts rapidly in the adsorbed phase on the catalyst surface with carbon monoxide and hydrogen to form propyl alcohol by a mechanism similar to that of the oxo synthesis. The initial production of the steady-state concentration of ethylene in the adsorbed phase may proceed by way of conversion of an adsorption complex of hydrogen and carbon monoxide to ethylene and water.

Recent work indicates that ethyl alcohol may be an in-

[14] Kummer, Dewitt, and Emmett, J. Am. Chem. Soc. 70, 3632 (1948).

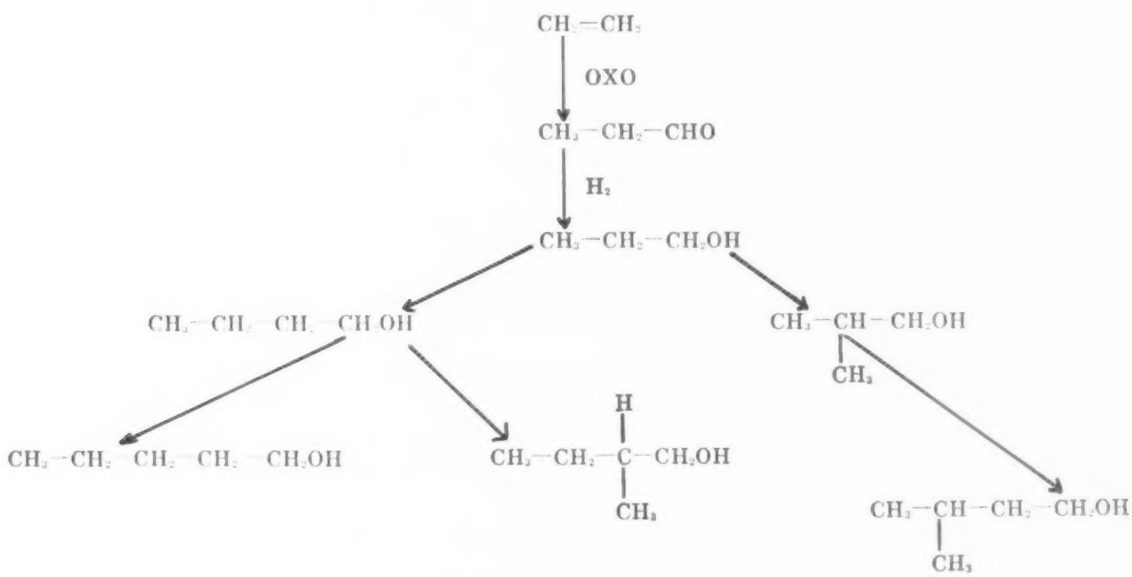
[15] Weller, Hofer, and Anderson, J. Am. Chem. Soc. 70, 799 (1948).

* The "synol" (synthetic alcohol) process is identical with the iron-catalyzed Fischer-Tropsch process except that the temperature is usually lower (185°-190°) and 25-100 volumes of end gas per volume of fresh synthesis gas is recycled to achieve much shorter contact times.

termediate in the Fischer-Tropsch synthesis of hydrocarbons. To help elucidate the mechanism of the Fischer-Tropsch synthesis, Kummer, Spencer, Padgursky, and Emmett added methyl-labeled and methylene-labeled radioactive ethyl alcohol to an equimolar mixture of carbon-monoxide and hydrogen being passed at one atmosphere over an iron catalyst at about 230°C. Measurement of the radioactivity of the hydrocarbon products showed negligibly small activity for all methane formed and an approximately constant molar activity of 2,150 $\pm$100 counts per minute for the C_5 to C_{10} hydrocarbons. The C_2, C_3, and C_4 hydrocarbons had molar activities of about 1,825, 1,850, and 2,000 counts per minute. These results suggest that either ethyl alcohol or some surface complex formed by the adsorption of ethyl alcohol could function as an intermediate in hydrocarbon synthesis over iron Fischer-Tropsch catalysts under these conditions.

It probably has occurred to the reader that treatment of an olefin with synthesis gas at 185° in the presence of a cobalt catalyst should lead, from the reactions described, to the building up of a spectrum of long chain, high molecular weight alcohols. Thus, if we started with ethylene, the propionaldehyde produced by the ordinary oxo reaction would be reduced to propanol-1 which should then react to give n-butyl and isobutyl alcohols, each of which could react further: (note illustration below)

These alcohols may be dehydrated over an acid catalyst (alumina) and the resulting olefins hydrogenated to hydrocarbons. The prospects for building a synthetic liquid fuels industry on these reactions is not too feasible, however, for the alcohols produced are always primary and react very slowly. However, as Dr. Storch has emphasized, these reactions are not poisoned by sulfur compounds (the Fischer-Tropsch reaction is) and require practically no special care or large expense in the preparation of catalysts; research leading to the possible establishment of a fuels industry based on these reactions is in order. Although success is not visible from this point, the attainment of such a process would dramatically change our outlook on the establishment of a synthetic liquid fuels industry in this country.



-WE'VE BEEN ASKED-

Will the integrity of Reserve T/O&E and T/D units be observed?

Yes.

Will Reserve Officers now on extended active duty who are serving in AUS grades below their Reserve grades be permitted to serve in their Reserve grades?

Yes. Under the following conditions. As rapidly as the Army is expanded, individuals in the category outlined above will be considered for promotion prior to ordering additional Reserve Officers of field grade to extended active duty.

I was issued a Reserve commission in October 1945 for five years. Will my Reserve commission expire in October 1950?

No. The National Defense Act provides that all Reserve commissions in force at the outbreak of a war will be frozen for the duration plus six months. The Department of the Army and the Department of the Air Force have recently announced that no Reserve commissions will be permitted to expire at this time. Reappointment regulations have been written and individuals can apply for a new Reserve commissions if they so desire.

What income limitation provision is attached to the pension I will get as the widow of an officer who died in a Japanese prison?

No income provisions are applicable to compensation payable for service connected death.

THE PRODUCTION ALLOCATION MANUAL*

. . . PREPARED FOR THE INFORMATION AND GUIDANCE OF INDUSTRIAL MANAGEMENT AND GOVERNMENT OFFICIALS, THE PRODUCTION ALLOCATION MANUAL DESCRIBES A PLAN FOR THE ORDERLY DISTRIBUTION OF THE INDUSTRIAL PRODUCTION LOAD FOR THE MANUFACTURER OF WARTIME REQUIREMENTS.

By

James J. Dwyer

The impact on industry of tremendous production requirements which would be occasioned by emergency mobilization of the armed forces of the United States can only be eased by advance planning for the transition of American industry from peace to war. Recognizing this fact, the Department of Defense established an industrial mobilization program as a major instrument by which our industrial advantage may be converted into a military advantage, both in peace and war.

As part of the program for planning with industry for the manufacture of assorted items of material for the armed forces a production allocation program has been established. Implementation of this program engendered the *Production Allocation Manual*, Munitions Board Manual No. 90-1.

This manual has been prepared for the information and guidance of industrial management and Government officials responsible for developing production plans with management. It describes a plan for the orderly distribution of the industrial production load for the manufacture of wartime requirements. It provides regulations and operating procedures governing the peacetime planning activities of the Department of Defense concerning the selection and allocation of manufacturing facilities suitable for use in wartime.

Within the Chemical Corps the operations involved in the *Production Allocation Manual* are accomplished directly in the field by the Chemical Procurement Districts, under the supervision of Procurement Planning Branch, and the policy guidance of Technical Staff, Supply and Procurement Division, Office of Chief Chemical Officer.

The *Manual* is in three parts:

Part 1—a brief description of the principles embodied in production allocation for the purpose of enlightening the reader with a general understanding of the Allocation program;

Part 2—the details of the program as written primarily for two groups of people: Government officials actively engaged in development of mobilization plans, and company officials who require detailed information for application of the program;

Part 3—appendices of supporting data, definitions of specialized terms and copies of statistical forms and tables.

To understand the function of the *Production Allocation Manual*, its place in the organization for National Security must be realized. The Department of Defense Industrial Mobilization Program comprises plans for among other things:

1. War procurement;
2. War distribution;
3. Demilitarization;

Of these, planning for war procurement comprises production allocations, a system of production priorities, war and material requirements compilations and procurement regulations. The *Manual* covers only the production allocation phases of plans for war procurement.

The Allocations program is a production scheduling job as well as a medium through which production planning is accomplished. An allocation is an assignment, agreed to by management, of predetermined quantities of specified items of material against the production capabilities of industrial facility for manufacture, in the event of war, at a specified rate of production. It will be noted that an allocation does not mean assignment of physical plants in whole or in part. On the contrary, it is an assignment of specified production schedules against the production potential of a manufacturing facility.

Range of Planning

The range of planning under the Allocation program covers planned production for:

a. Military weapons and equipment;

b. Civilian-type items required by the Army, Navy, and Air Force in time of war. Specialized wartime production requirements of certain other Government agencies and a reserve of productive capacity to meet civilian and war-supporting needs, are provided for in the Allocation program.

The program is designed to reflect an orderly distribution of the initial wartime manufacturing load among industrial facilities but it is not considered a solution to the problem of wartime control of production. Production plans developed with management must be reviewed frequently, and revised when necessary, to meet changes in the strategic plans, the production capabilities of industry, and the introduction of new types of weapons and equipment.

The Production Allocation program consists of policies and procedures that will be followed in developing plans with industrial management for a specific production that would be required in time of war. Production allocations approved by the Munitions Board under the provisions of the *Manual* constitute official clearance for their immediate activation in the event of war by means of production contracts that are acceptable to management and the Government.

Cooperating Agencies

The agencies of the Federal Government cooperating in the allocation of planned production for wartime procurement include:

National Security Resources Board;

* For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price 75c.

Munitions Board;

Departments of the Army, Navy and Air Force;

Atomic Energy Commission;

Maritime Commission;

National Advisory Committee for Aeronautics.

The National Security Resource Board functions as an overall coordinating and policy-making agency in the field of industrial mobilization planning.

The Munitions Board coordinates the military phases of the Production Allocations program and functions as the control agency in the operation of the program.

The Departments of the Army, Navy and Air Force and other claimant agencies function as operating agencies in carrying out the production allocation program with industrial management.

The participation of management in the allocation program, while vital to its success, is entirely voluntary. No production preparedness plans requiring the participation of management will be effected without his consent and cooperation. Management of each facility is encouraged to express his wishes and desires with respect to administration of the program as it relates to his facility and in the selection of a claimant agency to designate a coordinator to supervise the planning of all agencies desiring wartime production from his facility.

Production Categories

For purposes of the program, production of industry is divided into three categories:

Category I is production that is service or developmental in nature and not subject to allocation. Planning with management of this category of facilities may be accomplished by each claimant agency subject to regulations and procedures prescribed by higher authority.

Category II is production that is basic in nature or is a potential bottleneck to wartime supply such as raw materials, certain basic processed materials, food, industrial equipment and selected end items and component parts. This production will not be allocated, neither will plans be made to convert existing production capacity to other production. Although production will not be allocated, claimant agencies are authorized to confer with management of facilities that produce Category II items on technical matters such as design, specifications, production flow charts and engineering production plans. Claimant agencies may also submit their production requirements to management and obtain from him information concerning his ability to meet these requirements.

Category III is all other production. Allocation will be granted for this production with the consent and cooperation of management. Claimant agencies are also authorized, in cooperation with management, to plan for necessary conversion of the production capacity involved to meet planned wartime production requirements.

The selection of facilities for which plans may be developed is based on the nature and quantity of a plant's output and the strength and production know-how of management. The size of the facility is not a determining factor.

Direct planning by claimant agencies with selected sub-contractors and suppliers is provided for in the Allocation program. Allocations for sub-contract and supply production will be granted to the claimant agency concerned for the support of the contractor specified.

Coordination Emphasized

Also emphasized in the new manual is the desired coordination of current procurement with procurement planning. It is pointed out that the facilities of producers participating in mobilization planning should be utilized in the procurement of those items for which they have planned production whenever practicable. In the event current procurement is placed in a facility in which no allocation has been made or in which allocation has been made to a service other than the procuring service, and the procuring service desires the allocation to be made or changed, the matter will be brought to the attention of the Munitions Board. It is also emphasized that in the event of a national emergency, should cases of conflict arise between current production under existing contracts and planned production under industrial mobilization plans, the planned production under mobilization plans will prevail except where a current contract by its nature has equal or higher priority than the item planned for procurement under industrial mobilization planning.

There is also a section on the capacity to be reserved for civilian needs. This production, in time of war, will vary between industries and, within industries, between plants. Three guides are given for the determination of the amount of capacity to be reserved: (1) that percentage recommended by management, based if appropriate on his World War II shipment experience; (2) for metal fabricating facilities, a percentage as shown in Appendix II of the manual; (3) reservation in the neighborhood of 50 percent of the *current* average rate of hourly production utilization of the facility. In all cases, the recommendation from management on this matter is accepted above all.

It is noted that procedures for Category II planning are spelled out in the new manual in much clearer detail than in *Annex 47*. It is specified that production identified on a certain item basis in Appendix III of the *Manual*, as well as production for food processing, petroleum and certain petroleum by-products, is included in the Category II section for which allocation will not be made. The system and extent of planning that can be accomplished here are specified in detail.

The new manual also provides for a new series of forms for the execution of procedures of the program. These forms are as follows:

D. D. Form 403 "Request for Registration";

D. D. Form 404 "Industrial Facility Survey";

D. D. Form 405 "Desired Production and Production Schedule Work Sheets";

D. D. Form 406 "Tentative Schedule of Production and Request for Allocation";

D. D. Form 406a "Renewal Agreement covering Extension of a Tentative Schedule of Production."

D. D. Form 403 supersedes MB Form 59.

D. D. Form 404 supersedes MB Form 104. This form is to be accomplished by the ASPPO (Armed Services Procurement Planning Office) as soon as possible after planning is accomplished with management. In the event management objects to the survey in part, or in its entirety, it may be omitted. In this case reliance will be placed on management to indicate verbally, or by means of available brochures and pamphlets, the production capabilities of his facility.

D. D. Form 405 is a new form which has been developed to present to management the production schedule which is desired by the claimant agency. This form also provides space for management to specify which parts of the desired production he can accomplish.

D. D. Form 406 supersedes MB Forms 101 and 103. It is prepared from the information developed in D. D. Form 405.

D. D. Form 406a is for the purpose of extending the termination date specified on D. D. Form 406 and reaffirming agreements contained in a tentative schedule of production that has been accomplished by manage-

(Continued on Page 38)

A CONTINUOUS RECORDING APPARATUS FOR THE DETERMINATION OF PAINT SPRAY VAPOR . . .

By
ABRAHAM KOBLIN and JAMES D. WILCOX
Test Division, Technical Command
Army Chemical Center, Maryland

There was a need at the Army Chemical Center for a sampling test procedure which would determine concentrations of paint spray vapor in spray booths. Since the vapor concentrations could vary considerably, even over a short period of time, it was decided that a continuous recording apparatus would be best suited. As a result, a portable field instrument was developed utilizing the hot wire principle.

The field instrument as shown in Figure 1 consisted of the following essential equipment:

1. Metallic holder and filter paper to remove paint particles from the sampled air stream.
2. A drying tube containing barium oxide.
3. A high temperature hot-wire analyzer as a means for measuring the paint vapors (Davis Vaportester, Model 16).
4. A recorder for registering the values obtained by the hot-wire analyzer.
5. A vacuum pump and a critical orifice for maintaining a constant air sampling flow.
6. Six 1½ volt dry cell batteries as the power supply for the hot-wire analyzer.

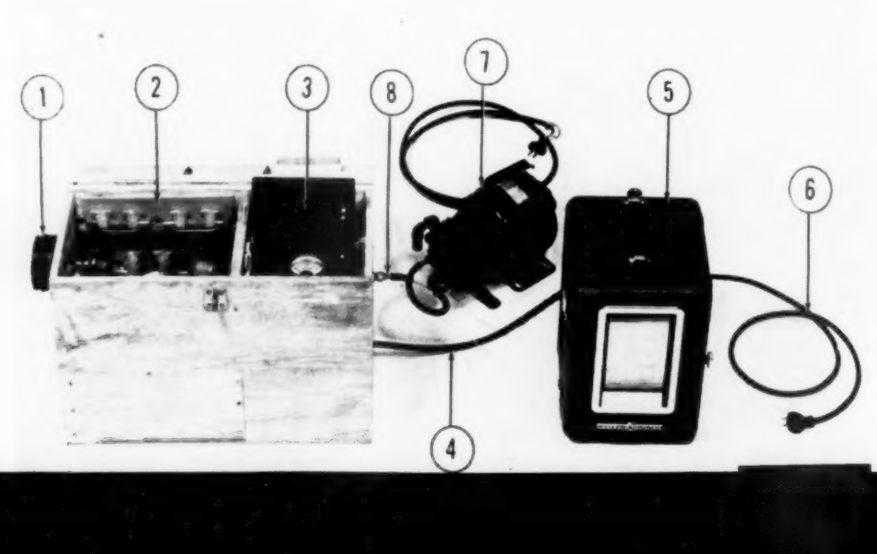
Method for Producing Paint Solvent

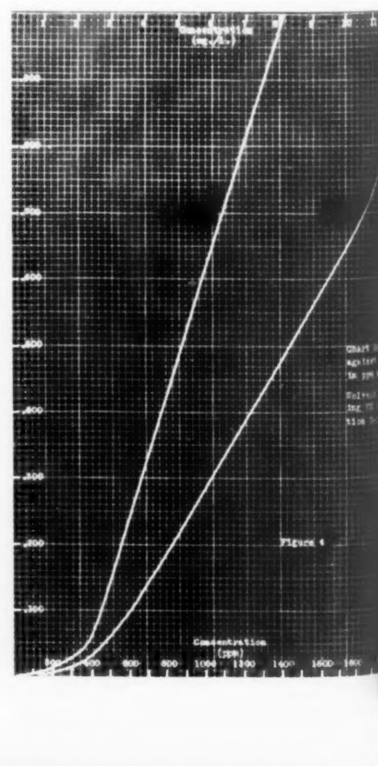
At a constant flow rate, air was passed through a modified beaded bubbler containing a known weight of paint solvent. The flow rate was controlled by a needle valve and a rotameter. The vapor concentrations were

(Continued on Page 38)

Figure 1

1. Metallic holder and filter paper
2. Drying tube and extra parts
3. Davis Vaportester, Model 16
4. Leads from meter to recorder
5. Recorder
6. Leads from recorder to 110 V. AC power source
7. Vacuum pump, Gast rotary type
8. Outlet from meter to pump





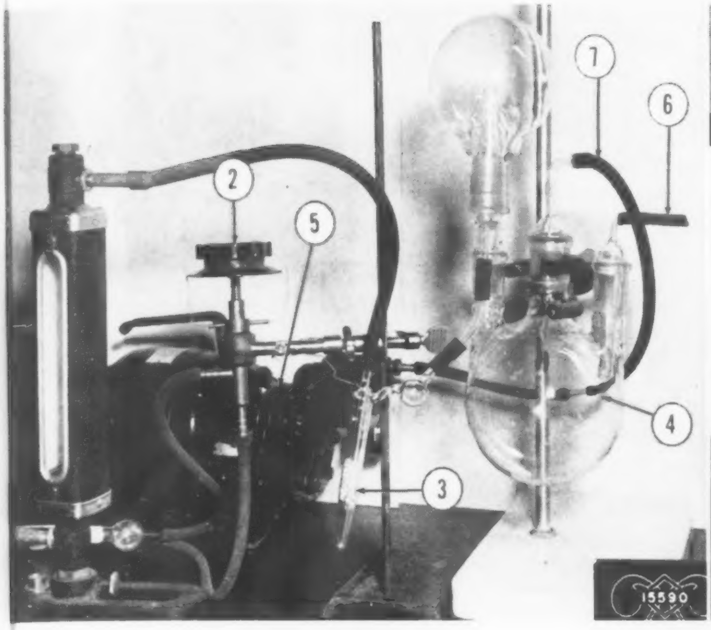


Figure 2

1. Rotameter
2. Needle valve
3. Beaded bubbler
4. Final mixing chamber
5. Vacuum pump
6. Sampling port to meter
7. Outlet to pump

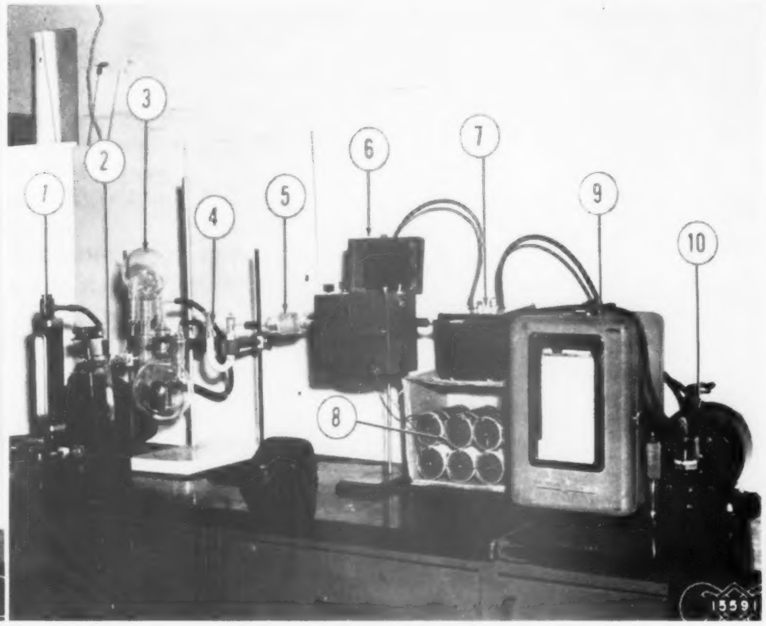
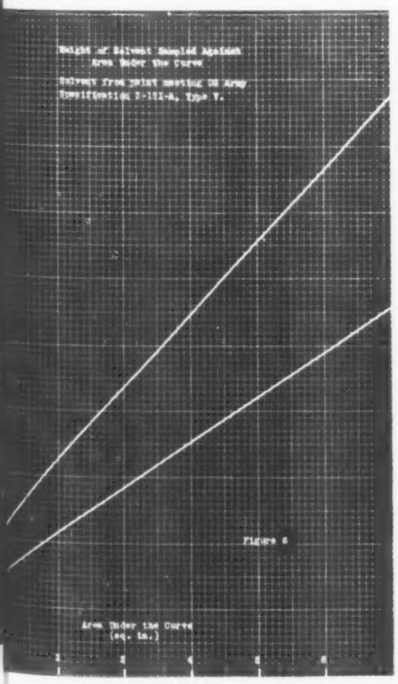
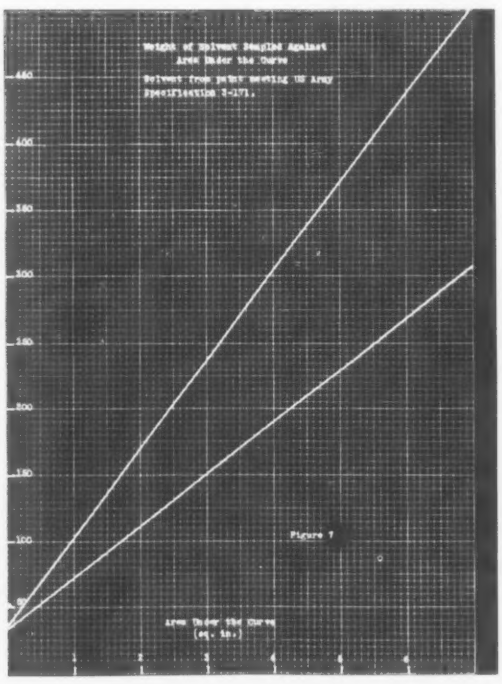
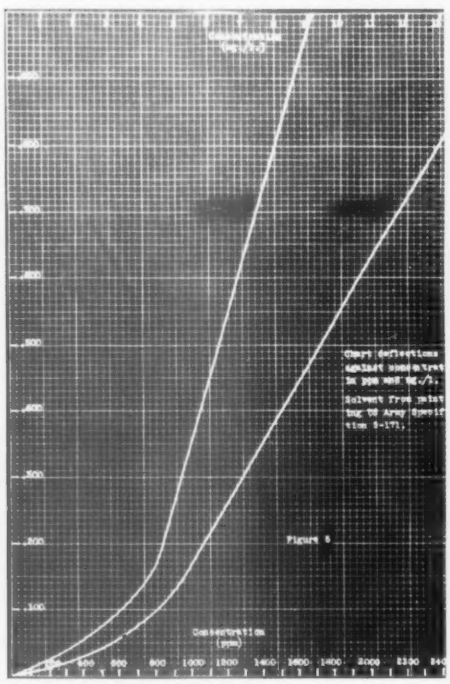


Figure 3

1. Rotameter
2. Beaded bubbler
3. Vapor chamber
4. Drying tube
5. Paper filter
6. Meter
7. Compensating box—adjusted so that recorder readings are identical with meter readings
8. Power supply for hot wire
9. Recorder
10. Vacuum pump







CHEMICAL RESERVE TRAINING

NEW YORK CITY 9721ST ORTSU OFFICERS SCHOOLED IN WAR PROCUREMENT NEEDS.

By Capt. John F. Carroll

In the interest of national preparedness, forty Reserve Officers of the 9721st Organized Technical Service Unit, under command of Col. Samuel N. Cummings, a Chemical veteran of World War I and II, have completed a two weeks course at the New York Chemical Corps Procurement District. Known as a "pre-mobilization training program," the course is designed to fit these business executives, school teachers and industrial chemists to undertake immediately the procurement operations of the Chemical Corps in the event they are called to active duty.

While others in the Reserves have been going off to training camps with rifles and field packs to the accompaniment of marching bands, these Chemical Officers descended on the New York Chemical Procurement Headquarters at 111 East 16th Street, armed with brief cases, fountain pens and typewriters. Although it is composed entirely of World War I and II veterans, many with combat experience, its primary mission is not combat but efficient business operation.

Among the duties of Chemical Procurement Officers, in the event of an emergency, is the negotiation of industrial contracts for Chemical Corps supplies and the supervision of manufacture and inspection of munitions, personnel protective devices, flamethrowers, incendiary mechanisms and fuels. In addition to the manufacturing and engineering specialists in a Procurement Unit, there are Officers with legal, fiscal and cost accounting backgrounds who maintain all records of contractor accounts, purchases, specifications and who audit and terminate Army contracts. In other words, their job is to see that reliable manufacturers are engaged to produce equipment for the fighting man, that this equipment will measure up to rigid specifications, that it is delivered when needed and that it is purchased at a fair price.

As part of this training program, the Reservists visited chemical and commodity manufacturing plants in the metropolitan area to learn how and where Army requirements are manufactured. They have been reviewing substitute materials and alternate manufacturing centers in order to comply with military requirements in the event of shortages.

Additional realism was added to the training by giving the student officers paper studies of actual manufacturing problems to inaugurate, follow-through, and deliver at the Port the required amount of a specific Chemical item. This involved the submission of specifications, inspection of manufacturers' facilities from a production and security standpoint, execution of the contract, chemical tests of the manufactured item, overseas packaging and even the preparation of the manifold shipping documents.

(Continued on Page 29)

PUBLIC INFORMATION OFFICER

OFFICE, CHIEF CHEMICAL OFFICER

1st Lt. Earle (Jack) Townsend, former aide-de-camp to Brig. Gen. E. F. Bullene, to direct Chemical Corps Information Program.

1st Lt. Earle (Jack) Townsend, Public Information Officer for the Army Chemical Center, Md., has been appointed Public Information Officer for the Office, Chief Chemical Officer, effective September 25, 1950.

Lt. Townsend was born October 18, 1915, at The Delles, Oregon, and received his B.S. in journalism at the University of Oregon in 1938. Prior to World War II he worked as a reporter on west coast newspapers.

He was inducted into the Army on April 21, 1941, and commissioned a second lieutenant in November, 1942. From November 1943 to May, 1945, Lt. Townsend was a Combat Liaison Officer with General Stillwell's outfit, Headquarters, China Combat Command, CBI, then training Chinese officers.

Discharged from active duty in November, 1945, he became Sports Editor of the *San Mateo Times* in San Mateo, California, from January, 1947 to early October, 1948. He was recalled to active duty on October 15, 1948 and assigned to the Army Chemical Center as Adjutant. He later attended the Armed Forces Information School at Carlisle Barracks, Pa., and was graduated in July, 1949. From that time until his present assignment he served as aide-de-camp to Brig. Gen. E. F. Bullene, Commanding General of the Army Chemical Center and as Public Information Officer for that installation.

WE'VE BEEN ASKED

Will field grade Reserve Officers be ordered to active duty at this time?

No. This is a very limited mobilization. There are many Reserve Officers on extended active duty of field grade who are serving in AUS ranks lower than their Reserve ranks. The Department of the Army has adopted a policy that individuals in this category will be promoted prior to ordering additional field grade officers to extended active duty. The exceptions are: (1) Any individual who has a highly specialized MOS that is urgently needed at this time; (2) Field grade officers assigned to units. When units are ordered to duty, all officers are ordered with the unit.

Will Reserve Officers going on extended active duty be permitted to serve in their Reserve grade?

Yes. Under the law, officers ordered to active duty without their consent must be ordered in their Reserve grades. The regulation which required that Reserve Officers volunteering for active duty agree to serve in the grade they held at the separation center has been rescinded. Consequently officers who volunteer for active duty, as well as those who are ordered without their consent, will be permitted to serve in their Reserve grade.

Will officers assigned to T/O&E or T/D units be ordered to active duty as individuals?

No. Individuals so assigned will be ordered to extended active duty when their units are ordered. The exceptions are: (1) An individual holding an MOS that is urgently needed might be ordered; (2) Individuals in such units who volunteer will be permitted to do so.

THE CHEMISTRY OF HC SMOKE MIXTURES*

By
Leo Finkelstein
Research Chemist
Chemical Division, Technical Command
Army Chemical Center, Maryland

Undoubtedly the greatest single advance in the technique of smoke production during World War I was the invention by Captain Berger of the French Army. His invention consisted of a pyrotechnic mixture based upon the reaction of a chlorinated organic compound (carbon tetrachloride) and a metal (zinc) to give a volatile hygroscopic chloride (1). Known as the "Berger Mixture" it was used to a considerable extent by the French Army. While both the United States and Great Britain experimented with the Berger Mixture, they never used it on World War I battlefields. The American contribution to the improvement of the Berger Mixture was the addition of an oxidizing agent to burn up the carbon which darkened the smoke (2).

Throughout the years following World War I a number of changes were made in the composition of the smoke mixture and, at the opening of World War II, a composition designated as "HC" Smoke Mixture contained a solid chlorinating agent, hexachlorethane, and the safer perchlorate as the oxidizing agent along with a retarder, ammonium chloride (3).

The supply of perchlorates was cut off in 1940 when France fell, thus necessitating a search for a substitute. The use of chlorate in the dry mixture was extremely hazardous, because of the possibility of free acid in the hexachlorethane, and the employment of nitrates resulted in spontaneous ignition of the smoke mixture. The use of the Canadian and British formula, which consisted of hexachlorethane, zinc oxide, and calcium silicide, was abandoned due to the inability of procuring sufficient calcium silicide of the required purity and fineness. The entire problem of pyrotechnic smoke mixture was reopened and a study of the reactions of zinc chloride smoke mixtures was undertaken.

The basic reaction between a completely chlorinated carbon compound and metallic zinc can be represented as:

$$C_xCl_y + y/2Zn \rightarrow xC + y/2ZnCl_2$$

This reaction is highly exothermic with the evolution of 165.3 kilogram calories or 581 gram calories per gram of mixture when carbon tetrachloride is used, and 244.6 kilogram calories or 565 gram calories per gram of mixture when hexachlorethane is used as the chlorinating agent.

The addition of zinc oxide to the Berger Mixture has the effect both of whitening the smoke and slowing down the burning time. In the reaction the zinc oxide is reduced to metallic zinc by the carbon with the absorption of 56.66 kilogram calories, and then reacts with additional amounts of the chlorinating agent. The addition of zinc oxide results in a high degree of stability, but earlier attempts to use it in the Berger Mixture were only partially successful, since the temperature attained was not high enough for complete reduction and a large unreacted residue remained.

The use of a mixture of aluminum, zinc oxide and a chlorinating agent was first proposed by Berger in his patent disclosure. The reactions which occur can be visualized in several steps as follows:

$$2Al + C_2Cl_6 \rightarrow 2AlCl_3 + 2C$$

This reaction is exothermic, liberating 279.6 kilogram calories.

$$2AlCl_3 + 3ZnO \rightarrow 3ZnCl_2 + Al_2O_3$$

This reaction is also exothermic, liberating 103.9 kilogram calories. Combining the equations:

$$2Al + C_2Cl_6 + 3ZnO \rightarrow 3ZnCl_2 + Al_2O_3 + 2C$$

This reaction is highly exothermic, liberating 383.5 kilogram calories or 717 gram calories per gram of smoke mixture.

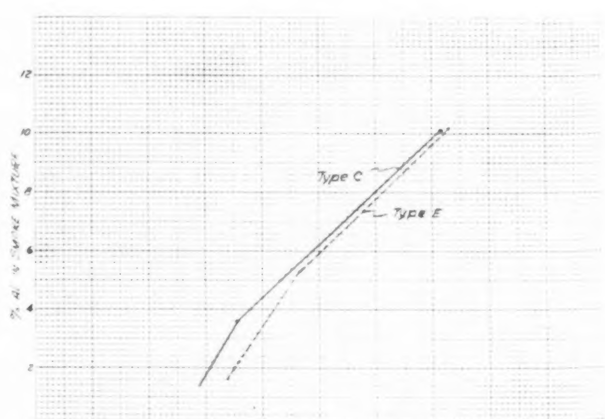
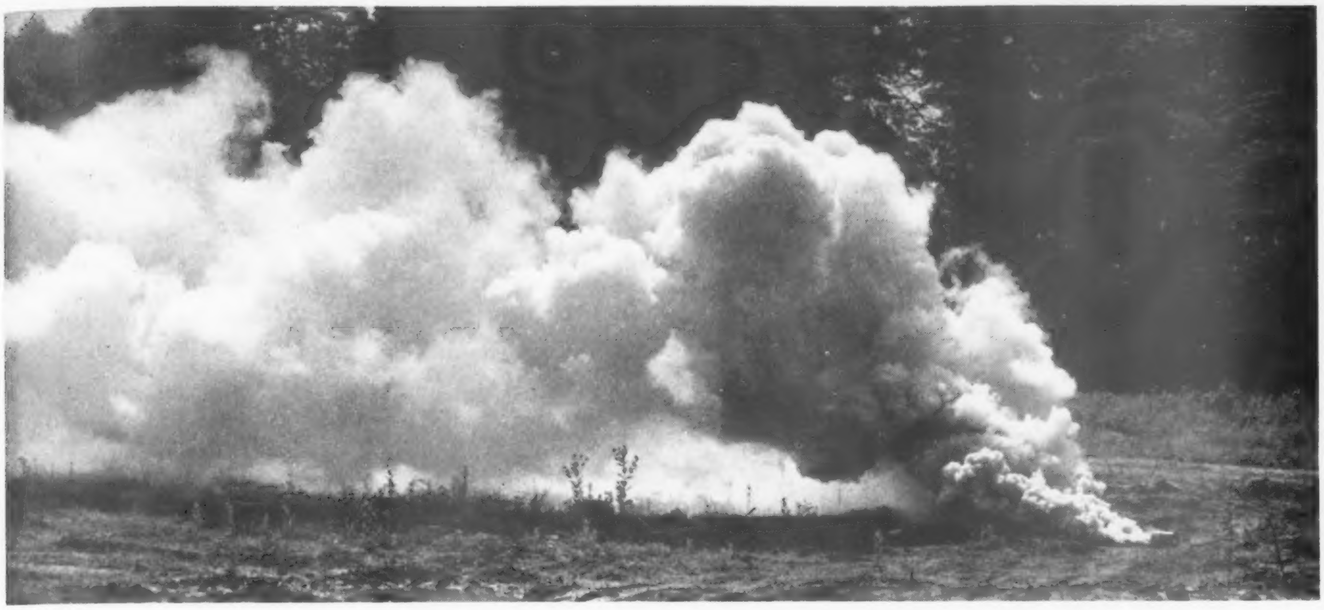


Figure 1
Heat Evolution of Type C and Type E HC Smoke Mixtures

* As presented to the Chicago meeting of the American Chemical Society.



Smoke Cloud Being Produced By an HC Smoke Pot, M5

The reaction can also be regarded as proceeding by the following steps:

$$2Al + 3ZnO \rightarrow 3Zn + Al_2O_3$$
$$3Zn + C_2Cl_6 \rightarrow 3ZnCl_2 + 2C$$

Of the two primary reactions, that of aluminum and hexachlorethane is believed to predominate (4). The reaction of aluminum and zinc oxide may occur to some extent, but the thermite-type reaction in the presence of hexachlorethane appears improbable. By reducing the aluminum content, but keeping the proportions of hexachlorethane and zinc oxide constant in the smoke mixture, the amount of carbon appearing in the smoke is reduced, thus making the smoke whiter and diminishing the burning rate (5). The reaction where no carbon is liberated is:

$$2Al + 9ZnO + 3C_2Cl_6 \rightarrow Al_2O_3 + 9ZnCl_2 + 6CO$$

The amount of aluminum in the above reactions can vary from 3.6 to 10.1 per cent. With the lower aluminum content only carbon monoxide is formed, and, as the aluminum is increased, free carbon begins to appear along with the carbon monoxide until at the upper limit all the carbon is in the form of smoke. If less than 3.6 per cent of aluminum is used both carbon dioxide and carbon monoxide are produced, and as the percentage of aluminum is still further reduced, the ratio of carbon dioxide to carbon monoxide increases. The heat evolved varies from 356 gram calories per gram of a smoke mixture containing 3.6 per cent of aluminum to 717 gram calories for the 10.1 per cent aluminum content. This smoke mixture, designated as Type-C HC, was adopted and manufactured in enormous quantities.

When carbon tetrachloride is substituted for the hexachlorethane, the percentage of aluminum ranges from 5.37 to 10.2 per cent for similar reactions. The heat evolution of the Type-C (hexachlorethane) and Type-E (carbon tetrachloride) HC smoke mixtures, when varying amounts of aluminum are used, is shown in Fig. 1.

The variation of burning time with aluminum content for the Type-C mixture is shown in Table I (6).

TABLE I

Variation of Burning Time of Type-C HC Smoke Mixture with Aluminum Content.

(AN-M8, HC Smoke Grenade)

Aluminum content (Per cent)	*Burning Time* (Seconds)
9.0	55
8.4	64
8.0	65
7.5	71
7.0	84
6.5	96
6.0	107
5.5	147
5.5	200

The burning time of the Type-C HC smoke mixture is also influenced by the fineness of the grained aluminum, the smaller the particle size the shorter the burning time. The effect of variation of grain size as shown by the rate of settling and burning time of the smoke mixture is shown in Table II (7).

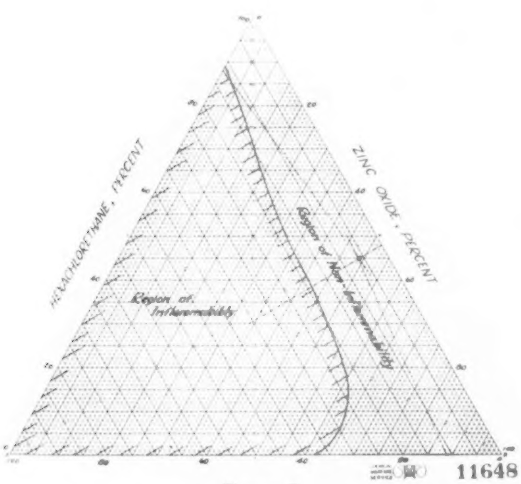


Figure 2
Inflammability of Type C HC Smoke Mixture

TABLE II

Correlation of Burning Time of Type-C HC Smoke Mixture* with Settling Rate of Grained Aluminum. (AN-M8, HC Smoke Grenade)

Time required for 50g settling (minutes)	*Burning time* (seconds)
6	150
9	95
10	87
12	80

*Composition:

	Per cent
Grained aluminum	6.68
Zinc oxide	46.66
Hexachlorethane	46.66

The character of the zinc oxide has a profound influence on the burning rate of the smoke mixture. Tests on 27 different samples of zinc oxide comprising 25 grades from seven manufacturers were carried out to determine the properties of commercial zinc oxide which have a significant effect on the burning rate of Type-C HC smoke mixture. AN-M8, HC smoke grenades which were loaded with a smoke mixture containing 6.25 per cent of aluminum, 46.9 per cent of hexachlorethane and 46.9 per cent of zinc oxide were found to vary in burning time over a threefold range (from 27 to 90 seconds) depending on the zinc oxide used. This variation was dependent on the moisture, carbonate, and sulfate content, and the particle size of the zinc oxide used. Very fine and very coarse zinc oxides form slower-burning mixtures than those of intermediate size. For fast-burning smoke mixtures a moderately large particle size of zinc oxide with a low moisture and carbonate content is to be preferred, while for a slow-burning mixture, a very small particle size zinc oxide, or one having a high carbonate content should be used. The blending of a coarse and fine zinc oxide will result in a faster burning mixture than would be predicted from the burning time of the individual oxides. The apparent density of the zinc oxide has no direct effect on the burning time of the Type-C HC smoke mixture (4).

In the Type-E (carbon tetrachloride) HC smoke mixture where the zinc oxide absorbs the liquid, the consistency of the filling varied from wet and dough-like to dry and powdery as the relative density of the zinc oxide decreased. The rate of burning of the mixture also decreased as the relative density of the zinc oxide decreased (8).

When the aluminum is reduced below 5 per cent, the burning time becomes erratic and other means are employed to retard the burning. The substitution of basic zinc carbonate for the zinc oxide, in a quantity not exceeding 7 per cent of the zinc oxide, was recommended. However, the stoichiometric ratio of zinc to hexachlorethane must always be maintained. Among other retarders which lengthen the burning time of the Type-C HC smoke mixture, urea and Monastral blue dye are the most powerful. Naphthalene was found to have a great retarding action on the faster-burning mixtures, but little or no effect on the slow-burning mixtures, while sucrose, Vinsol resin and anthracene were not found to be satisfactory.

Instability of the mixture is caused mainly by the presence of soluble chlorides in the zinc oxide or hexachlorethane in the presence of water. The following appears to be the sequence of events when water gains access to a Type-C HC smoke mixture:

(1) The water dissolves a certain amount of chloride from the zinc oxide or hexachlorethane.

(2) The aqueous chloride solution reacts with the aluminum. The hydrogen produced under these conditions reacts with the hexachlorethane:

$$H_2 + C_2Cl_6 \rightarrow HCl\ C_2HCl_5$$

(3) The chloride produced from the hexachlorethane promotes further reaction of the aluminum through promoting further decomposition.

The stability of Type--C HC smoke mixture having a total moisture content of 0.6 per cent has been found to be very good (9).

Type-C HC smoke mixture could not be ignited in a laboratory furnace at temperatures up to 1,000°C or in an inflammability apparatus using a high-voltage low-wattage electric spark as ignition source. Neither could ignitions be obtained with a 6-ampere, 40-volt, DC carbon arc. The limits of inflammability of aluminum—zinc oxide—hexachlorethane mixtures are shown graphically in Fig. 2. The limit for a binary mixture of hexachlorethane and aluminum, probably contains 11 ± 1 per cent aluminum. It should be noted that no binary mixture of hexachlorethane and zinc oxide is inflammable. The composition of Type-C HC mixtures lies well inside the region of non-inflammability. In impact tests a 5-kilogram weight was dropped 3 meters, striking on a flat steel disk on which the smoke mixture was placed. No ignitions resulted in 10 such trials. In friction tests a heavy pendulum shod with a curved steel shoe which scraped across a steel anvil several times before coming to rest was used. No ignition of the smoke mixture resulted from this test (10).

In the zinc chloride smoke mixtures previously described all the chlorine carriers have been organic. When an imminent shortage of chlorine appeared during the war, attention was focused on the possibility of developing inorganic chlorine carriers derived from hydrochloric acid, and it has been found possible to utilize compounds such as anhydrous ferric chloride in the production of zinc chloride smoke (11). The following reactions probably occur in a mixture of aluminum, ferric chloride and zinc oxide at high temperatures:

$$2Al + 6FeCl_3 + 9Zn0 \rightarrow Al_20_3 + 6Fe0 + 9ZnCl_2$$
$$2Al + 2FeCl_3 + 3Zn0 \rightarrow Al_20_3 + 2Fe + 3ZnCl_2$$

The heat of reaction per gram of smoke mixture for the above reactions is 186 and 378 gram calories respectively.

The objection to the use of anhydrous ferric chloride in a smoke mixture is its hygroscopic nature which makes it difficult to handle in moist atmosphere. To obviate this difficulty, Comings has proposed the use of ferric chloride complexes such as $KFeCl_4$ (12).

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NATIONAL CHEMICAL EXPOSITION

By Col. Harry Kuhn, USA-Ret.

One of the outstanding noncommercial exhibits at the National Chemical Exposition in Chicago, Sept. 5-8, was that of the Chemical Corps. This animated exhibit demonstrated the principle activities of the Chemical Corps in chemical, biological, and radiological fields and was first exhibited in public at the Annual Meeting of AFCA at Virginia Beach. In connection with this exhibit the Chicago Chapter of AFCA manned an Association booth for members and prospective members where literature including the Directory was available.

Directors Meeting

The Directors Meeting of the AFCA was called to order by President Lawson at the Hotel Stevens in Chicago on the afternoon of the 6th. It was the largest turnout of any Directors Meeting to date. Dr. Lawson reported the marked improvement in the financial condition of the Association in the past six months, due to a large extent to the elimination of the loss on the JOURNAL. He reported also a 25% increase in group members for the same period. General Porter stressed the necessity of close cooperation between the Corps and the Industry members of the Association. General McAuliffe's presentation was "off-the-record" and indicated ways in which the Association may help the Corps in fulfilling its new military mission. General McAuliffe pointed out that the Corps is now the central procurement agent for chemicals for the armed forces, which increases the load on the Corps considerably. Admiral Snackenberg supported the idea that more attention should be given to the Chemical Corps and that larger funds should be allocated to procurement activities.

Chicago Chapter Dinner

The dinner given by the Chicago Chapter, AFCA, in honor of General McAuliffe, Chief Chemical Officer of the Army, held at the Congress Hotel on the evening of September 6, was attended by over 500 enthusiastic visitors. Among the distinguished guests were Admiral J. Cary Jones, Commandant Ninth Naval District; Admiral J. A. Snackenberg, Assistant Chief, Bureau of Ordnance; the Senior Organized Reserve Instructors of the Army, Navy, Air Force, Marine Corps and National Guard as well as Dr. E. H. Volwiler, President of the American Chemical Society, and Maj. Gen. William N. Porter, along with a large number of distinguished industrialists representing some 60 chemical companies.

General McAuliffe, introduced by Association President Lawson, spoke to the group concerning the procurement planning program of the Chemical Corps. (Full text of General McAuliffe's speech is given on page 28 of the JOURNAL.)

NEWS OF INDUSTRY

GEORGE H. BAKER

Heads Wyandotte's Employee Relations

Formation of an employee and public relations division of Wyandotte Chemicals Corporation has been announced by Robert B. Semple, president. The new division will coordinate all human relationship activities of the company with George H. Baker, recently active with American Potash and Chemical Corporation in similar activities, heading the new division. Prior to entering the chemical industry at the close of World War II hostilities, Baker was a colonel and assistant to Maj. Gen. Lewis B. Hershey, director of Selective Service. He also headed the manpower section of Selective Service and had close contact with the problems of industry.

* * *

Pittsburgh Plate Glass Co.

Pittsburgh Plate Glass Company is preparing to add a fourth tank with two drawing machines at its Clarksburg, W. Va., window glass producing plant.

According to J. A. Wilson, vice-president of the firm's glass division, construction of a building to house the new production equipment will commence immediately. The building program and installation of equipment should be completed by May 1, 1951.

Estimated cost of the structure and equipment is about $500,000.

Stauffer Chemical Co.

New Research Lab Facilities

The Stauffer Chemical Co. announced on August 9 that construction of a new Research & Development Laboratory at Dobbs Ferry, N. Y. will get underway at once. When completed, the building will house the Research Staff of the Company's Eastern Division now scattered at several locations in and around New York City.

Five large laboratories for various research projects, administrative offices, technical library, work shop and storage and service areas are provided. All rooms and laboratories will be air-conditioned and equipped with a wide variety of the most modern equipment.

Stauffer's Chauncey Plant is located across the Parkway and will furnish facilities for pilot plant testing of products and processes developed at the new laboratory. The location permits the staff convenient access to New York City technical libraries and to Stauffer's general offices. Mr. John F. Crowther, Director of the Company's Eastern Research Division will be in charge.

The Stauffer Chemical Company, 65 years old this year, operates thirty-odd plants in almost every industrial area of the country. Other chemical research laboratories are located at Los Angeles and at Richmond (San Francisco), California where Dr. Chester L. Arnold, Director of the Company's Research & Development Dept., makes his headquarters. The Company also operates an Agricultural Chemical Research Laboratory near Los Altos, California.

* * *

Hagan Corp. District Office

A new Los Angeles district office has been established at 3931 Tweedy Boulevard, South Gate, California, by Hagan Corp., Pittsburgh combustion and chemical engineering firm, and its subsidiaries—Calgon, Inc., Hall Laboratories, Inc., and The Buromin Company.

The office also will represent Bull & Roberts, which is associated with Hagan Corporation and subsidiaries in the marine engineering field.

LOUIS W. MUNCHMEYER

Promoted by Ansco

Louis W. Munchmeyer has been promoted to Assistant General Manager of Ansco by James Forrestal, General Manager of Ansco and Ozalid, and Vice President of General Aniline & Film Corporation.

Mr. Munchmeyer joined Ansco a year ago as Executive Assistant to Mr. Forrestal. Previously he held a similar position in the office of Dr. Cary R. Wagner, Vice President in charge of operations for General Aniline & Film Corporation in New York City.

Mr. Munchmeyer held the rank of colonel in the Army Chemical Corps. Early in the war, he was executive officer of one of the branches of the Army-Navy Munitions Board and later he served as chief of various branches in the Office of Chief, Chemical Corps. At the end of World War II, he was in charge of operations at Huntsville Arsenal, Huntsville, Ala.

Recently, Mr. Munchmeyer was elected First Vice President of the Armed Forces Chemical Association.

* * *

General Aniline & Film Corp.

John H. Hilldring has been appointed General Manager of Foreign Operations in charge of the newly created Export Division of General Aniline & Film Corporation, Jack Frye, President has announced.

NIHON KYOSANTO

COMMUNIST DISAPPROVAL OF FASCISM—AND KOREAN GOVERNMENT

The Party's constitution calls for a national general meeting once a year.

LEFTIST DEMONSTRAT

The Red Flag became filled with

After official acceptance of the Potsdam Declaration by the Signatories to the Instruments of Surrender, 2 September 1945, in Tokyo Bay, many of the Japanese leaders and people began their programs "to restore and strengthen democratic tendencies" within their defeated country. At 6:00 P.M. on 18 December 1945 the Imperial Diet was dissolved, an act which brought an end to a parliament whose membership had been dominated by the *Gumbatsu's* or military cliques selected and sponsor-elected candidates.

In this short interim between these two major events, now almost five years ago, many adherents to the same personalities and issues, grouped themselves together to form *to* or political parties. Of the some sixty of these, but scarcely one fifth of them appeared demonstrative of an active life. Today in Japan only four political parties of nation-wide membership and strength vie for governmental power. This contesting they do more particularly within the national government's arena rather than those within the 46 prefectural, 234 city, 1,810 town and 8,000 village governments which house the slightly more than 80,000,000 Japanese.

Nihon Kyosanto or Japanese Communist Party, reorganization in and reorganization out, is the oldest political group in Japan. At its Fourth National Convention which was its first *post bellum* official meeting in Tokyo, the first three days in December 1945, the old underground horses pulled out new members and together they revitalized the Party, established a platform of deliberate planks and then sallied forth to sully the newly formed political scene.

The Forerunners

There has been in Japan's immediate past history, a relatively long movement composed not only of socialistic and laborite thought and action but also radical teachings and communistic forays. The movement, begun in the early 'eighties, can be characterized also as having had (1) sporadic outbursts of temper and force, (2) great and small gatherings, (3) the public's sympathy and fear and antagonism, (4) the aid and opposition of the

By Cecil G. Tilton

NIHON KYOSANTO OR JAPANESE COMMUNIST PARTY IS THE OLDEST POLITICAL GROUP IN JAPAN. AT ITS FOURTH NATIONAL CONVENTION IN DECEMBER, '45, THE OLD UNDERGROUND HORSES PULLED OUT NEW MEMBERS AND TOGETHER THEY REVITALIZED THE PARTY AND SALLIED FORTH TO SULLY THE POLITICAL SCENE.

ATTACKING U. S. ARMY PERSONNEL
pointed agitational material.

ARRESTED MEMBERS OF COMMUNIST-LED DEMONSTRATORS
Party Headquarters in Tokyo proved lucrative to the Ministry of Home Affairs.

press, (5) a leadership of literatti and strong-willed men of "no schooling," and (6) a watchful and fast but an always harsh and intimidating police action. A partial summation of this movement, all that is possible here, will not give its true measurement, but such will point up some facts about Japanese liberals and Japanese undesired radicals having had "their day" in a docile yet well-ordered Japan.

In the year 1881, the Tosa leader and *hanbatsu* liberal, Taisuke Itagaki, together with a few other Meiji patriots formed the Liberal Party, the first political party of real moment in Japan. Its platform encompassed social reform. In the year following, the book, *Communism and Socialism* by Theodore D. Woolsey, was translated and printed in the Japanese; it was circulated widely for those days. Also in May of that same year, 1882, the Oriental Socialist Party was founded in Kyushu at Shimabara among the distressed and harassed farmers, to advance the adoption of "the greatest good principle" for all. Shockingly factual to an autocratic government and to puzzled Japanese capitalists, was the incident in 1883, in which the newly formed rickshaw men's union of Tokyo fought the operations of the horse tramway company. In 1892 Kentaro Oi, with a sizeable political following formed the Oriental Liberal Party, whose goal was to fight for the working men and downtrodden—shoemakers, rickshaw men, carpenters, and stone masons were the Party's members.

As the years progressed through the turn of the century newspapers and magazines of general circulation in Japan carried names and words and phrases taken from the writings and speeches of socialists, radical reformists and agitators of the western world. Japanese books and articles on Japanese conditions expressing Japanese socialistic thought appeared. Most all were suppressed. However, a great many had a clandestine circulation. During the same years, groups and parties attempted to publish, and some did publish, their own papers and gazettes, elaborating upon and advocating socialistic ideas and principles. And all of this they did

ABOUT THE AUTHOR

The comments of this article are entirely those of the author. Tilton, a lieutenant colonel in the U. S. Army Reserve, is the author of ASF Manual 354-2, "Japan, Government and Administration." He entered Japan in August, 1945 on the forward air echelon of General MacArthur and was on his staff for the ensuing 34 months in Government Section, GHQ SCAP. After a year and a half as Chief, Legal and Government Division, Civil Affairs Section, HQ, U. S. Eighth Army, he returned to GHQ SCAP temporarily in January 1950. He is now Director, Government and Legal Department HQ., Military Government of the Ryukyu Islands. Colonel Tilton was awarded the Legion of Merit and the Department of Army citation for Civilian Meritorious Service by General MacArthur.

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in the new and expansive verbiage. Not too surprisingly, the *Heimin Shimbun*, founded 13 November 1903, on its first anniversary, published the Japanese translation of the *Communist Manifesto*. In addition to this "Toilers of the World Unite," there were the circulated translations of stirring and radical books which entered the hearts of some Japanese quite deeply, like those of Peter Kropotkin, the Russian prince and anarchist. Imperial punishment came swiftly too! Because of *Heimin's* publishing the *Manifesto* and of its prior agitation against tax increases, the Imperial Government suppressed the paper's circulation immediately. In September 1905 a socialists' riot damning the Katsura Cabinet for its limp attitude of not demanding more in the Treaty of Portsmouth from the defeated Russians, produced martial law and an attempted crushing of socialist organizations and affairs. Three years later on 22 June 1908 came "the Red Flag Incident:"* after a "coalition" and joint meeting of anarchists and Marxian socialists in Kanda Ku, the delegates in marching and singing "The Shackles of Wealth" through streets, found the police upon them; many were arrested, and a few received prison terms, including Yusaburo Sakai, who strangely enough "wasn't even there!" During the year 1910, in the secret trials of Shusui Kotoku with 23 other men and women for plotting the assassination of the Emperor, a conviction was obtained for him and a kindred 11 more. Breaking the precedent for the 60-day period between pronouncement and execution of the convicted, the Imperial Government upon completing the trials, January 1911, sentenced them and hanged them within a three-day interval.

Following World War I, and in terms of the Imperial Japanese Government's laws and ordinances for public order and peace preservation, there occurred many riotous acts, labor conflicts in strikes in mines, plants and docks, especially in the chaotic year 1919, and other "highly subversive" plots. In reviewing the radical movement as a whole, one can, in a measure, be surprised "at all of this" occurring in quiet Japan. Yet for the record, it has to be stated that Japan has never allowed the socialist-communist movement either the breadth or height which it has secured flamboyantly and belligerently in other western countries.

The Communist Party's Beginning

Without the Japanese membership, the Baku Congress of Nations of the Orient in 1921 formed the communist movement in Asia.* Through invitation and funds from a Chinese communist who came to Japan immediately following the sessions of the Congress, Japanese delegates attended the Third International Convention in Moscow; they returned to Japan inspired in communism. On 15 July Taisho 11, or the year 1922, the First National Convention of Japanese Communists was held and the Party was established. Too, it was recognized by the Comintern as a branch agency. Some prominent Japanese communists attending were Tashihiko Sakai, Hitoshi Yamakawa, both good radicals; Kyuichi Tokuda, a graduate of Chuo University Law School and one who had just returned from Moscow; Teishim Nabeyama, a labor leader; Shoichi Ichikawa, a graduate of Waseda University and a writer; and Gaku Sano, a graduate of the Tokyo Imperial University Law School. An immediate "joiner" was Sanzo Nosaka whose career shows him a most active communist. During the spring of Taisho 12, a wholesale arrest of many of its leaders and members all but scuttled the Party. A convention was held two years later to regroup and reform, but the time was not until 4 December 1926 that a major convention was held at the Goshiki Hot Springs in Yamagata Prefecture and an "action program" adopted. The leaders here were Yoshio Shiga, a graduate of Keio University, a traveler to Moscow the year before; a new convert, Kazuo Fukumoto, a graduate of Tokyo Imperial University also; and Gaku Sano. Some 200 were in attendance at Goshiki. The issues of the platform vigorously adopted among many other ideas, called specifically for:

1. Fight against any imperialistic war.
2. Hands off the Chinese Revolution.
3. Defense of the Soviet Union.
4. Complete independence of colonies.
5. Dissolution of the Diet.
6. Abolishment of monarchy in Japan.
7. Universal suffrage for men and women over 18.
8. Freedom of the press.
9. Eight-hour labor day.
10. Unemployment insurance.
11. Abolishment of anti-labor laws.
12. Confiscation of land owned by the royal family, state, temples and shrines.
13. A progressive income tax.

During the four years preceding this conference, a number of Japanese had traveled to Moscow. Following the conference, others too, went there and returned "con-

* Sakae Osugi and Kanson Arahata raised the first red flag in Japan at Kinki Kan in Kanda Ku at Nishiko-cho to celebrate the release of Kaken Yamaguchi from prison.

* See the brilliant "Japan Since Perry" by the Yale Professor, Chitoshi Yanaga.

vinced." All took up their sacred duty to engage in "the inevitable class struggle." Indeed, they and their followers have never let it down Nor has one of their inspirators, their Soviet zealots, let it down. And surely, many an easy going democratic soul will get *the* hit on his head too late for his taking any preventive action against the powerful odium. The Japanese communists to circulate their orders and ideas, published a party organ. The *Akahata* or Red Flag became filled with dogma and pointed agitational material.

The Imperial Japanese Government determined that neither the Communist Party nor communists, nor any other radicals, should have a firm place in the Empire. The Peace Preservation Law was a product of the Kato Cabinet in 1925; the Articles were of great breadth, both in sphere and criminal punishment. During the two-year period of General Baron Tanaka's Cabinet, two crushing, nation-wide raids on the communists were effected. In that of March 1928 three-fourths of Japan's 47 prefectures were covered resulting in the roping by police of well over 50,000 suspects of whom more than 2,000 were students in the Imperial universities. The Party's headquarters in Tokyo, and its many other offices, proved lucrative to the *Naimusho* or Ministry of Home Affairs. In the raid of April 1929, another scooping up of the rallied braves took place, but the press was not allowed to carry the "story." Had not the first raid scattered the communists to Moscow and "in all directions," this second one would have. During the middle period of the Hamaguchi Cabinet, in February 1930, more bubbles were sighted on scummy communist waters, and so another drainage of the areas took place. Only a few daylight resurges in the tide were observable afterwards, and then the whole radical wave sunk underground.

The Socialist-Communist movement in Japan existed. It was real. It caused anxiety. It harbored ills for millions. It embodied utopian hopes to millions, yet the movement never encompassed over 100,000 Japanese, a figure not .001 of the total population of Japan.

The Communists' Rejuvenation

The three days of the Party's Fourth National Convention burst openly with jubilance. Clandestined forces were now breathing loudly in the daylight; the many who had feared being heard of or seen together anywhere were now mingling in true fraternal manner. So shortly released from over a decade and a half of prison life, fiery Tokuda and Shiga became leaders anew, if not momentary idols to many. Amid these Party pleasantries, however, other Japanese leaders, they too from various walks of life, had their difficulties in convincing both Tokuda and Shiga that the world had moved many miles beyond the place in which they last left it; their confinement had closed them off from their "beloved proletariat." Their thoughts and language were yet in the earlier and now antiquated Marxian style, "the peasants," "the workers," "the class struggle," "the people," and "protection from the hated bourgeoise!" Despite such Party floundering, all leaders did try to reorganize the Party; they attempted to draw newcomers into the Party, and through their platform, they *told* the Japanese people what the communists as a Party would accomplish. In their speeches and in the working of the Party's platform, they did not mince affairs; their statements were not mere clamorings of what they *intended* to do. Many Japanese now say after a few years and more of disbelief, "When most communists speak of what they are going to do, we know that more than their intentions is meant." The platform was bold and fairly short. In summary, the Party advocated the emancipation of the Japanese people from hunger and poverty; it struck for the establishment of a happier and better livelihood for the people; it sought the thorough punishment of all the war criminals whatever numbers there might be; it demanded the abolition of Japan's system of Imperial rule with the promptest ousting of Emperor Hirohito and royalty; it urged the adoption of a democratic constitution, and it championed the creation at once of a "government of the people."

Kyosanto was, and has been, the only Party which consistently attacked the Imperial constitution. With no representation in the Diet, the communists, nevertheless, for months forced the members of the major parties, *Nippon Jyuto* or the Japanese Liberal Party, *Nippon Shaikaito* or the Social-Democratic Party, and *Shimpoto* or the Progressive Party, into both muffled and sharp discussions of issues which hitherto had never been allowed.

With their old and new few hundreds of members, the leaders launched their campaigns from Tokyo and Osaka. In Tokyo in particular, the communists urged

COMMUNIST PROTEST TO THE NEW KOREAN GOVERNMENT
Leaders with their masses speak with force, command, emotion and pity.

and pleaded for "a progressive movement" and "a united front." All who could from anywhere were coaxed to join. With full tactics in sway on 17 December 1945, the communists rushed into the anti-government rallies of the Social-Democrats. They were there, they said, to give support; what they wanted was aid—a joint program and their "united front." Right then and during the next year and a half overtures were made to *Shakaito* for a joint program—mutual support for each other; however, a minimum of four definite offers were turned down deliberately. Each of these rebuffs was serious for the communists. The radicals of the Social-Democrats' left wing were most sympathetic to *Kyosanto*. Their appeals and storming within their Party at times seemed to overcome the right wing; such did produce a vacillation in *Shakaito* policies, but they did not cause a surrender. Tetsu Katayama and his Socialist seconds, although under constant and tremendous pressure, did not give in, but maintained their Party aloof and reserved it to Socialists and their own program.

It was in January 1946 that there returned to Japan from China an intelligent, suave, mild-tempered, but cunning little Japanese communist. Sanzo Nozaka from *Sixteen Years* of *Exile*, stepped into the Japanese political arena and directly to leadership of the Communist Party. In his first speech to the Japanese he captured the press and thousands of Japanese because, though firmly but with deep emotion, and therefore through heart-to-heart in Japanese fashion, he told them all the Communist Party must be *loved* by the Japanese! This little Japanese communist for the past four years has been the counterpart to Shiga and Tokuda. The three have dominated the Fifth and Sixth National Conventions of 24 February 1946 and 21 December 1947, and the Party's Central Committee. Sanzo Nozaka's experiences in life are like those of many Russian anarchists and communists. Like them he, too, has displayed fearlessness, ability and tenacity of purpose. In 1917 he inclined his "ear to communism." After a year in England, he aided in establishing the English Communist Party in 1920, and soon afterward was ordered to leave by Scotland Yard. He returned to Japan via Russia, France, Switzerland, and Germany. He was arrested in June 1923, again in 1925, and again in 1928, this time with his wife. Allowed bail for an operation on his eyes in March 1930, he went as an exile to Moscow in 1931 via Kobe, Moji, Dairen and Vladivostok. Nine years lates in Yenan, China, he arrived as Susumu Okano and in quick time expanded Watoru Kaji's Anti-War League for Japanese prisoners of war into the Japanese People's Emancipation League. Also Okano had Japanese POW's after being "students" in the Japanese Peasants' and Workers' School, become a voluntary part of the Chinese Communist Eight-Route Army. After five years of this skillful indoctrinational work on his Japanese "fellow compatriots," he came back to Japan for the Communist Party's "emergency."

Leadership in the Communist Party in Japan with the exception of a man of means, is composed of the intelligent, suave and forceful—bracketed to various strata of Japanese society. The leaders with their masses speak with force, command, emotion, and pity, and they address "the little man" adroitly in *his* own language.

In addition to the *Akahata* which is used normally as a wall poster, Kyosanto publishes *Shinso* or the Inside Story. In this magazine the Party specializes on boudoir stories and some issues have devoted to stories on the Emperor's and Empress' private lives. All methods of appeal or attack are utilized by the Party.

No great flood of socialistic-communistic books or pamphlets has come off the press in Japan. Governmental publicational requirements are partly responsible. Yet there are a number of books, both written and translated, which circulate, and today, much more widely than before the Surrender. Kazuo Fukumoto's book on dialectical materialism filled with many formulas and excerpts from Marx, entrances many students. Important is the fact that four Japanese translations of *Das Capital* have been made. Motoyuki Takahata's and Hajime Kawakami's translations were the early ones. Kawakami was the Kyoto Imperial University professor. Some six books such as *Socialism in Review*, *Story of Poverty*, *Story of Poverty II*, and his monthly magazine, *Study of Social Problems*, demonstrate his thoughts. His autobiography published just before his death in 1948, was a best seller.

Thus too, there is a literary element of importance in today's kyosanto. In both this and in speech there is the "*Jimmin no tameni tatakau!*" or "We fight for the people!"

The Communist Party's Organization

The communists have organized their Party by the traditional and beloved proletarian standard: the national convention of the peoples' representatives, the central committee, the regional committee areas, prefectural committee areas, the district committee areas, and cells.

Kyosanto To Taikai, or the Communist Party National Convention is the agency which establishes, supposedly, the major policies and platform for the Party. Six have been held since the Party's founding, the last in February 1947. The Party's constitution calls for a national general meeting once a year. This requisite has not been met because, I suppose, the "lower" comrades have either agreed or requested that the Central Committee determine the course for the daily "class struggle." All are quite happy about this. A few have said so, and surely this policy is the thinking of the others. The Convention is called and presided over by *Tosei Iinkai*, a small group of "representatives" on the Control Committee. Depending upon such factors as the program, certainly the desire of all comrades to have an equal opportunity to agree with each other and the Party members' finances, the Convention's duration may be from one to three days.

Chuo Iinkai, or the Central Executive Committee, is the nucleus from which Japanese communistic ideas and tactics fission; here, too, the directions from the Soviets take Japanese form. *Chuo Iinkai* is composed of about 30 members, sometimes more, sometimes less, which is precisely the variation the "upper" comrades like. It is chairmanned by the *Shoki Cho* or Secretary General, and it is divided into two agencies: *Seiji Kyoku* or the Politburo and *Soki Kyoku* or Secretariat. No other level of the communist hierarchy has an established Politburo. Functional responsibility is charged specifically to a variable number of committees which cabin all workable ideas and develop the strategy, if not the actual tactics for their other comrades to execute. *Nihon Kyosanto Tohombu* or the Japanese Communist Party's headquarters in Yoyogi, Tokyo is diagrammed in the chart.

The second echelon of the party is composed of eight *Chiho Iinkai* or Regional Committees. Each has charge of an area in which there are a number of prefectures and a sizeable population. Each has a small secretariat and functional committees corresponding to those in the Central Executive Committee. I am informed that these Regional Committees do more than mere channeling of directions and information. Their degree of executive authority, which they can use at will, is problematical.

The third echelon in Japan is composed of 46 *Ken Iinkai* or the Prefectural Committees, one for each of Japan's prefectural governmental jurisdictions. Here local issues loom larger, the daily "class struggle" becomes more real and "the dictatorship of the proletariat" much sweeter. Again functional committees smaller in size and in num-

ber operate. Reports are consolidated and information is centered. Programs are planned for meetings and speeches for the various cities, towns, and villages in the prefecture. Perhaps now, too, they plan protection for their *daijinbatsu* or great men when speaking because in Kyushu many months back Tokoda, the charger and rabble rouser, was tossed a home-made bomb which "tore holes in his skin in many places!"

Chiku Iinkai or District Committees make up the fourth echelon of the Party's structure. They function night and day within the prefecture's boundary. Each *Chiku Iinkai* has *saibo* or fractions or cells; in general, there are two, one *Keiei Saibo* or business and enterprises, and one *Kyoju Saibo* or the residents and inhabitants. From a reading of each of these titles, it is evident as to the type of work the group concerned carries out and to whom the members go. It is the communists of these groups who do the bowing, the calling, the money collecting, the making of promises, and the fulfilling if at all, the continuous casting of doubt on the orderly processes of government, and the daily agitating so much the part of Soviet strategy.

The costs of the operations of *Kyosanto* are defrayed from two sources: first, most all comrades and workers, especially at times of election, give endless hours of time and many physical necessities for the benefit of the Party, and it would be difficult to estimate anywhere near accurately a sum total of such kinds of savings; second, the financing in yen has a series of origins, a few of which are disputed and cloudy. *Dues* of the members are collected in the Communist Party. *Collections* are both from within and without the Party one way or another. *Contributions* have been made to the Party in many parts of Japan, but no series of benefactors have appeared. *Orei* or "thank you gifts" for the securing of tax reductions on an individual's tax schedule, have been given. It is worth Y20,000 or Y30,000 to a person if the communist agent will argue, bargain, and fight long enough with the tax office and save him the payment of Y100,000 of the total tax bill. In cases in which suitable evidence has been obtained, prosecution, conviction and the sentencing of tax officials and others have resulted together with a proper recovery of the funds and settlement is made properly. Profits, fat and handsome, are said to come from the black market sale of illicitly brewed *sake*. This certain profitable activity is more particularly carried on by a person who is a communist and whose "love of the comrades" induces him to give handsomely, than it is an activity directly under Party administration. Some Japanese have also charged the communists with obtaining funds through smuggling operations and even to the use of counterfeit paper money. These charges have produced hot denials from communists. Charges and counter-charges *ad infinitum!*

It will not be questioned that both the Party and all its members husband their funds most dutifully. The totals of the Party's coffers, of course, are not public, nor of individual's either. However, some informative financial comparisons appear for funds for elections. In the *Report of Surveillance*, 23 January 1949, for Japan's Third National Election in the Occupation, prepared by the Military Government Section, Headquarters Eighth U. S. Army, a tabulation of political contributions by parties was shown to be:

Democrat-Liberals		Y13,171,444
Democrats		2,038,850
Social-Democrats		4,312,501
Communists	Central Region	26,124,597
	Kanto Region	1,395,449
	Kansai Region	878,245

In the same report, receipts and disbursements by individual candidates showed the successful Sanzo Nozaka with receipts of Y276,166, disbursements Y130,078, and over Y20,000 under his legal limit. Also Kuichi Tokuda, successful 3rd District candidate with receipts Y157,000 disbursements Y100,725 and Y10,000 under his legal limit.

Thus it must be stated that neither *Kyosanto* as a party, nor communists as individuals, have suffered financially for their election affairs.

Kyosanto Tactics

The Communist Party as a Japanese Political organ and members of the Party as individual Japanese have engaged all comers on all issues. Some of their offense and parrying have been skillfully done. Some have been accomplished with cunning and deceit. Some have been coaxing and cajolery. Some have been mystification. Some have been intimidation, fraud and unnerving blackmail. Some have been with cold reason. Most have been with emotion. *All have been purposeful.* Regardless of the method on the precise issue, but one purpose for the Japanese communists and their Party exists—Ring in communism; ring out all else! Neither the Party as such, nor the members as communists, have been idle, asleep or listless. Both Party and members have been ever watchful, opportunity seeking and inventive. Moreover, and of great importance, as in other areas of the world in which the communists have either achieved power or infiltrated and gained numbers locally, so too in Japan, the Japanese leaders of the Party have insisted, and been most successful in establishing Party discipline. The Japanese communists obey and follow their Party's rules. But will Nozoka, Shiga, Tokuda and their comrades play their *Nihon Kyosanto* so as to bring a roar out of Moscow on them as Tito in Europe is still receiving for his "independence."

The atmosphere pervading the Party's rejuvenation and for many months thereafter, was favorable to it despite the living hate borne by millions of Japanese toward the Soviets. *Kyosanto* brought into Japan a crusading spirit. The Communist Party in Japan offered and has offered the Japanese definite goals, something to reach for, something to possess. More than any other party during and *in between* elections, April 1946, April 1947 and January 1949, *Kyosanto* has struck hard on all possible issues. When issues were not "available," the communists invented them, made them real, and hung on to them. The Party planned its strategy carefully and kept in really intimate contact with "the masses." Thus, while the other parties were content keeping contact with their *tobatsu* or party bosses, *Kyosanto* did not do just that but struck deeper by going on to *live* with the voters. These tactics paid the Party dividends for its position of four seats by the April 1947 elections, was increased almost nine times in January 1949 in which 35 seats were gained.

A few illustrations of the Party at work show their methods.

In the active campaign during election days, speakers of many parties were often heckled and disturbed in their speeches. This practice is not liked by the average Japanese audience; polite manners for the public are most important. One evening before a large assembly of voters in Tokyo, Nozaka was rounding out his campaigning in the First District, which won him election with a great majority. Hecklers of rival parties began challenging and causing commotion. Communists surrounding the disturbers began a counter attack vehemently and instantly. There ensued yelling and fist shaking. Nozaka, from the

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"UNTIL THAT TIME . . ."*

"AS RECENT REPORTS FROM KOREA INDICATE, FLAME THROWERS, INCENDIARIES, NAPALM AND SMOKE SIGNALLING DEVICES ARE ACTIVELY SUPPORTING UNITED NATIONS FRONTLINE ELEMENTS. THE CHEMICAL CORPS, WITH THE COOPERATION OF INDUSTRY, WILL DO ITS PART IN THE NATIONAL DEFENSE SCHEME TO ACHIEVE UN OBJECTIVES."

By
Maj. Gen. Anthony C. McAuliffe
Chief Chemical Officer, D/A

The spirit of teamwork which exists between the Armed Forces Chemical Association, the American Chemical Society, and the Chemical Corps is once again evidenced by our gathering here this evening. It is a pleasure to appear before you and to make your personal acquaintance here in Chicago, one of my favorite cities.

But our meeting is taking place at a time when the forces of freedom and democracy are again being challenged by dictatorial forces that would enslave all mankind and eliminate the rule of law from our society. Only a few days ago on September 2, VJ-Day passed by hardly noticed. On that memorable day, just five years ago, the free world hoped that the dearly bought victories of World War II meant the end of dictatorships and the reestablishment of international morality throughout the world. But how mistaken this thinking was proved.

For it was not long after the end of World War II that we saw the true colors of communism unveiled. Despite international agreements, the tentacles of Communism proceeded to envelop the lawfully constituted, but weak governments of many nations struggling to reestablish their national life. The Iron Curtain dropped across the face of eastern Europe, sealing the doom of those nations drawn within the communist orbit. Guerilla forces sought to overrun weakened Greece, Czechoslovakia was swiftly doomed. Communist minions also swept over Asia, flooding ancient lands with their new philosophy.

During this entire time, the communist bloc ignored their solemnly assumed obligations. The pattern of imperialistic communism became even clearer as the Berlin blockade went into effect and the military forces of Poland were taken over by communist military leaders.

What was the reaction of the free world to these aggressive policies?

It became immediately evident that additional funds would be required to recoup these supplies. In his first message to Congress on the Korean situation, President Truman requested 10 billion dollars in supplemental appropriations for the Department of Defense to support combat operations. Of this amount, 31 million dollars was earmarked for the Chemical Corps. This sum will be used principally for procurement or manufacture of normal Chemical Corps items to replace present shortages. These funds will not be available for contract purposes, however, until approved by Congress.

* * *

The overall responsibility for the industrial mobilization program of the Department of Defense rests with the Munitions Board. Based largely upon experience gained in World War II, the military aspects of this program have been divided into four categories; namely, maintenance of reserve plants; acquisition and maintenance of essential machine tools and manufacturing equipment; planning studies and industrial preparedness measures, and planning within the Department of Defense.

A primary aspect of the program concerns the allocation of civilian industrial capacity on a priority basis to members of the national defense team. By setting up comprehensive policies to govern every phase of industrial mobilization and procurement planning, the Munitions Board hopes to assure effective mobilization of the nation's industrial resources in an emergency.

In addition to the foregoing, these policies serve to eliminate competition among the military services. Many of you will recall that at the beginning of World War II, industry was busy producing large amounts of equipment for European nations under the Defense Aid program. When the United States entered the war, it was found impossible to implement the Munitions Board's industrial mobilization plan, as it then existed, owing to the fact that heavy contracts had already been placed with industry.

Since the end of World War II and up to the time of the Korean crisis, the Munitions Board has allocated primary procurement responsibility to the technical services according to their specific missions. The Chemical Corps, for example, is authorized to procure all chemical supplies, not only for other arms and services of the Department of the Army, but also for the Navy and Air Force. You can easily see that this single responsibility means greater procurement efficiency and enables us to develop

* This article is based upon the address of General McAuliffe to the Chicago Chapter of the Armed Forces Chemical Association, Sept. 6.

comprehensive plans with industry for emergency procurement.

In this connection, the Chemical Corps has a unique problem with which I believe many of you are familiar. Approximately ninety percent of the Corps' material is strictly military in nature, having no civilian counterpart. Some of our newly developed items have never been produced by industry. Others have never been produced in qualtities required by the strategic plans of the Joint Chiefs of Staff. But many of these problems are being solved through our industrial preparedness contracts with industry, and through the procurement planning program of the Corps.

The Department of Defense earnestly requests that all subcontractors make direct contact whenever possible with anticipated prime contractors. Contractors can also help by becoming familiar with Munitions Board Production Allocation Manual. This manual contains all procedures concerning production planning for emergency procurement and may be obtained direct from the Government Printing Office, Washington 25, D. C.

Through your knowledge of these procedures and our procurement plans, I feel that you, as representatives of the chemical industry, will be ready to assist the Chemical Corps in effectively meeting its responsibilities and objectives in supplying, wherever and whenever required, chemical supplies and equipment. As recent reports from Korea indicate, flame throwers, incendiaries, napalm and smoke signalling devices are actively supporting United Nations frontline elements.

These measures, however, are just the beginning of our job. It is only through the defeat of the communist aggressors by our combined industrial and military might that the United Nations, which the United States fully supports, can hope to re-establish international law and order. We will thereby do our share to carry out the foreign policy of the United States, which is designed to maintain and defend the peace. The Chemical Corps, with the co-operation of industry, will do its part in the national defense scheme to achieve UN objectives.

* * *

By our support of United Nations decisions in Korea, the moral, social, economic, political, and military strength of the United States acts as a shield behind which lawful international society can grow and flourish. The policy of the United States is designed to safeguard freedom, to promote international order and to further the well-being of all peoples of the world. It looks toward the establishment of an international community based on the voluntary consent of the nations and peoples concerned. It does not imply compulsion as to the governmental structure, the cultural traditions, or the social forms of any nation or people.

This policy has helped to restore economic health to free Europe and a significant measure of political stability and morale. It has proved successful in Greece, Turkey, Southeast Asia, and in Latin America. The captive peoples of eastern Europe are being provided with a constant source of hope for liberation from communist aggression. Yugoslavia has been aided in maintaining its independence.

As the strength and confidence of the free world developed, the communist bloc may begin to see the advantages of arriving at reasonable decisions with other interested powers on important and still unsettled international questions. Until that time, however, the free world, without destruction of its own liberties or economy, must show in both material and moral ways that it is the world of the future—the world in which international law and order preserve peace for all mankind.

MURDOCK J. McLEOD

Interrment services for Major Murdoch J. McLeod of 10407 Barrie Avenue, Silver Spring, Maryland, who died suddenly at his home on Saturday, September 2nd, will be held with full military honors in Arlington National Cemetary on Thursday, September 7th, following services in the Fort Myer Chapel at 10:30 a.m. He is survived by his widow, Mrs. Virginia Matthews McLeod, a daughter Mary Sandra, and a sister, Mrs. John Fitzgerald of Washington, D. C.

Major McLeod was born in Linden, Washington, on April 28, 1910. He was graduated from Washington State College in 1931 and was a member of Sigma Delta Chi Journalism Fraternity. He pursued a newspaper career on the west coast until 1938, when he came to Washington, D. C. with the Rural Electrification Administration, Department of Interior, as a Public Relations Specialist.

From 1931 to 1939, Major McLeod was a member of the Officers Reserve Corps. In 1940, he accepted a commission as a Captain in the Marine Corps Reserve. He saw active duty as a Combat Intelligence Officer with the Second Marine Division in the bloody battles of Saipan and Okinawa, receiving the Presidential Naval Unit Citation.

Following demobilization in December, 1945, he returned to the Department of Interior as Editor and Writer for the Bureau of Reclamation. In September, 1948 he was recalled to active duty by the Department of the Army with the rank of Major. He then served on the staff of the Medical Division, Army Chemical Center, Maryland, as a Technical Specification Specialist. During this time he resided at 5623 Lothian Road, Baltimore, Maryland. In March 1950, Major McLeod was appointed Public Information Officer for Office, Chief Chemical Officer, Chemical Corps, Department of the Army, serving in this capacity at the time of his death.

"Major McLeod was an especially good friend of the Armed Forces Chemical Association. He worked closely with the editorial staff and gave much aid whenever this was requested. He will be missed greatly by our Executive Committee."

CHEMICAL RESERVE TRAINING

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Colonel Cummings and his deputy, Colonel D'Angelo injected into each project "every administrative and technical booby trap" which occurred during their World War II experience with Chemical procurement. Apart from genuine pitfalls, the officers were expected to overcome such production road-blocks as mythical destruction of facilities by sabotage and bombing, depletion of supplier's stock of an essential component, and the lack of trained manpower. In addition, consideration was given to inefficient manufactures, opportunists lacking in production experience and potential "security risks." Then, to top off the training program, each officer was obliged by necessity to acquire a healthy respect for paper work by preparing the various forms necessary to take care of the procurement of a desired article.

Colonel Harold A. Cooney, Senior Army Instructor, expressed himself as well-pleased with the vast amount of enthusiasm which went into the execution of this unprecedented exercise.

Barring the unforeseen, it is anticipated that the fine work at the start will be continued during the coming year by means of various weekend contact camps, in addition to the regular bi-weekly training sessions.

TRAINING BRITISH ARMY OFFICERS

By Major John North *

IN PEACETIME BRITAIN'S ARMY HAS TO BE PREPARED TO TAKE ON A VARIETY OF "POLICING" DUTIES; IN WAR IT'S A FIGHTING UNIT. IN EITHER EVENT OFFICERS OFTEN FIND THEMSELVES IN A SITUATION WHERE A TRAINED INTELLIGENCE WILL SERVE THEM BETTER THAN ANY MILITARY MANUAL.

A former battlefield is a good location for a talk with a general about the work of the Army—particularly if that battlefield happens to have been the scene of a victorious action. In such a setting I found Lieut.-General Richard N. Gale, now Director-General of Military Training at Britain's War Office, and former commander of the Sixth British Airborne Division which held the vital left flank of the Normandy invasion front. It was against this somber and historic background that General Gale talked to me about the system of training Britain's future Regular Army officers now in vogue at the Royal Military Academy, Sandhurst, in the English county of Surrey.

First, let me review the salient facts about the organization of the Academy. In 1946 the Royal Military Academy, Woolwich, founded in 1741, and mainly responsible for the training of several generations of fine gunnery officers, and the Royal Military College, Sandhurst, founded in 1799, were amalgamated as the Royal Military Academy, Sundhurst, which now provides an 18 months' three-term course for professional officers in the making. There are two methods of entry. The first is for boys between 17½ and 18½ still at school who take the Army entrance examination, pass a selection board and then join the ranks where they serve at least four months. The second is for men under 19½ (in very exceptional cases 21) who are serving in the ranks, either as Regular soldiers or as National Service men. These may face an educational test before the same board and if selected enter the R.M.A., Sandhurst.

A permanent staff of over eleven hundred ministers to the needs of the thousand cadets normally in residence. No fees are paid by the parents. Before the 1939 war it would have cost them £100 a term.

The Range Of Studies

During his three terms the cadet works through a syllabus of 2,184 periods. Of these only 819 are devoted to military studies; 1,040 go to academic subjects; the remainder are for games and private reading. Of the 819 "military" periods, drill claims 135 and 71 come under the category of "fitness training." The rest are devoted to tactics, administration, military history and law, and general questions of morale and man management.

The non-military studies are directed by a staff of 65 civilian instructors; the curriculum is comparable with that of a first year course at a university. There are two faculties—Science and Mathematics, and Modern Subjects. These cover political theory, economics, international relations, history, and the French, German, or Russian languages. The technically talented officer who takes science and mathematics is able to proceed to an advanced course as a preliminary to joining the Military College of Science. Students in both faculties, in order to avoid excessive specialization, are given another 200 periods for two "special subjects" not included in the syllabus of their particular faculty.

At the end of the course all cadets are placed in an order of merit based on character and study reports; each is allowed to nominate three choices of arms in order of preference. A cadet is then selected for a Regiment or Corps in accordance with the needs of the Army and his place in the order of merit. Special family connections with any particular Regiment are taken into consideration.

Thus it may be contended that a new wind is blowing through the British Army's sacrosanct Sandhurst. Training is free; that training is educational as well as vocational—little more than one third of the syllabus being devoted to recognized military studies; and the attire of the university don is almost as much in evidence as the Army's own uniform. The Regular officer of the future will of necessity have started his Army career in the hard way; training still emphasizes the importance of leadership and discipline but—to take one example only—no cadet is likely to emerge from the Academy today without a lively understanding of the full implications of Western European Union. The widened syllabus covers a thorough study of current affairs and the Sandhurst of

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* Major North is a former British Staff Officer with World War II experience in Northwest Europe, Italy and North Africa.

A FOGGY MYTH

HERE IS WHAT ACTUALLY HAPPENED . . .

By PAUL W. PRITCHARD

(Illustrated by Katherine and William Ilk)

Historical Office, Office of the Chief Chemical Officer

Army Chemical Center, Md.

During World War II many legends centered about the illustrious General George S. Patton, Jr., commanding general of the Third U. S. Army. The CWS, in ETOUSA, was responsible for one tale which had its inception during the XII Corps crossing of the Sauer River, in the drive through the Siegfried Line. The legend, based both on fact and on conjecture, developed along the expansive path common to all rumors and finally assumed this form:

In mid-February 1945 the 5th Infantry Division was attempting to cross the Sauer, near Weilerbach, into the teeth of the Siegfried Line. At one spot, according to the legend, infantry troops were hesitating to attack. The assault boats, it appeared, might not be able to navigate the muddy, rapid waters safely, and German pillboxes, according to latrine intelligence, rimmed the far bank, waiting to put machine-gun fire on any advancing Americans. General Patton was inspecting the front lines that day and just happened to encounter the hesitant foot soldiers. Did he order them to cross immediately? No, according to rumor, he said, "Come on, boys, we're going to attack," plunged into the Sauer and swam across. The others followed. Other infantrymen who had, somehow or other, already reached the far bank and were entrenched on the hillside, verified the account, because, with their own eyes, they actually saw General Patton emerge from the muddy water. How could they be wrong when the event occurred within a distance of 100 yards;

The story spread like wildfire throughout the ETO. Enterprising correspondents passed it on to eager and anxious listeners in the States. General Patton denied the story, but to no avail. The public had, by this time, adopted General Patton as one of its heroes. The story was too "Pattonesque" to be discarded. General Patton repeated his denial in *War As I Knew It* (Boston, Houghton-Mifflin, 1947, pp. 232-33) and offered an explanation of how the swimming legend might have arisen.

Here is what actually happened:

The 84th Chemical Smoke Generator Company was screening the Sauer Valley bridge sites of the 5th Division, near Echternach and Weilerbach. Wind conditions were ideal. After filling the valley with smoke from a number of generators, the 84th maintained the screen for the balance of the day by operating only two generators as the deep valley trapped the smoke. The infantry footbridge at Weilerbach was partially submerged by the high water. The haze limited clear visibility to a distance of less than the width of the river. During the day General Patton crossed the footbridge, wading through water to a depth of three or four feet.

According to General Patton, any soldier on the far bank might well have believed that the Army commander had swum across the river. Through the fog oil haze it may have appeared that the general was swimming, not walking or wading. If fog oil smoke deceived our own troops so effectively, what must it have done to the enemy?

CHAPTERS

ARMY CHEMICAL CENTER CHAPTER

President, Fred B. Shaw, Army Chemical Center, Md.
Secretary-Treasurer, Mrs. Marie E. Klug, Army Chemical Center, Md.

★

BALTIMORE CHAPTER

President, Capt. Paul Bauman, 17 Osborne Avenue, Catonsville 28, Md.
Secretary-Treasurer, Howard N. Williams, Pemco Corp., 5601 Eastern Ave., Baltimore, Md.

★

BOSTON CHAPTER

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THE H. K. FERGUSON COMPANY

NATION'S LARGEST "ATOMIC FURNACE" FOR RESEARCH BEGINS OPERATING AT BROOKHAVEN NATIONAL LABORATORY.

AFCA MEMBERSHIP AT WORK

With engineering design and construction carried out by The H. K. Ferguson Company of Cleveland and New York under the supervision of Wells N. Thompson, vice president, the nation's largest and most powerful research reactor began operations in August at the Brookhaven National Laboratory at Upton, New York.

At 2:30 a.m. on August 22 Dr. Lyle B. Borst, in charge of the reactor (atomic pile), signalled for removal of control rods, thereby starting the initial chain reaction. Loading of uranium to bring the reactor to its full designed power will continue for several months. Meanwhile, scientific experiments will begin, with the reactor operating 24 hours a day.

The "atomic furnace" is an air-cooled, graphite-uranium pile which, at its designed power level, will develop heat at a rate of 30,000 kilowatts, several times that of the AEC reactor at Oak Ridge National Laboratory, Tenn. The contract under which Brookhaven operates is supervised by Wilbur E. Kelley, manager of the New York Operations Office of the AEC, and E. L. Van Horn, manager of AEC's Brookhaven area.

What it Does

Brookhaven's reactor itself is a giant cube of graphite into which uranium metal is inserted in a very exact pattern. Its primary purpose is to produce neutrons for scientific experimentation. Neutrons are the particles of the nucleus of an atom which most easily split other nuclei. In a reactor this splitting becomes a chain reaction, in which neutrons cause uranium nuclei to fission (split), thereby releasing more neutrons which split more uranium nuclei, producing more neutrons, and so on.

Thus a pile in operation becomes a vast reservoir of neutrons and a source of fission products, the radioactive substances into which the uranium nuclei are split. The dense population of neutrons inside the reactor gives ample opportunity to gain further knowledge of the neutrons themselves and of substances exposed to them. The neutrons will be utilized by inserting materials into the reactor, or by allowing beams of neutrons to emerge under controlled conditions through holes in the shield surrounding the reactor.

Most chemical elements, when inserted in the reactor and bombarded by neutrons, emerge radioactive (able to send off rays or particles). Known as radioisotopes, they are used by physicists and chemists to study the fundamental nature of matter. Many radioisotopes decay by emission of rays or particles in short times (minutes, seconds or less) and thus require study close to the reactor. For this reason, Brookhaven's reactor has pneumatic tubes which whisk samples to be studied into the reactor and out to adjacent laboratories in a few seconds. Other radioisotopes which exist for longer periods will also be studied. Radioisotopes especially in this latter group also serve as important research tools in biology, medicine, agriculture and engineering.

Other types of experiments make use of the neutrons within the pile, or beams of neutrons emerging through openings in the shield wall. Scientists and engineers interested in the design of future reactors which can be used for submarine power plants, plutonium production or commercial power, will study the changes in structural properties of materials when exposed to the neutrons and other rays inside the reactor. Biologists study the changes in plants and animals when exposed to the radiations from the reactor. The neutron beams emerging from the reactor will be most useful in getting more information about the neutron itself and the ways in which it interacts with nuclei and atoms.

The layout of the reactor and its equipment are especially designed to accommodate a larger number of simultaneous neutron-using experiments than are possible with any other known reactor. The walls bristle with wiring, tubes, rods, switch boxes and other instruments to aid exacting experiments.

Control

Operations of the reactor are controlled from a room equipped with a multitude of devices for continuously recording the power level, the neutron concentration and the other operating information essential to the delicate adjustment of the reactor to research needs. Control rods containing boron serve as blotters to soak up neutrons vital to the chain reaction. They can be inserted or removed by very delicate mechanisms and thus to control the intensity of the chain reaction precisely.

There are several alternative mechanisms for instantaneous automatic shutdown. The boron control rods give complete flexibility of operation from shutdown to maximum power. The design thus incorporates a maximum degree of safety based

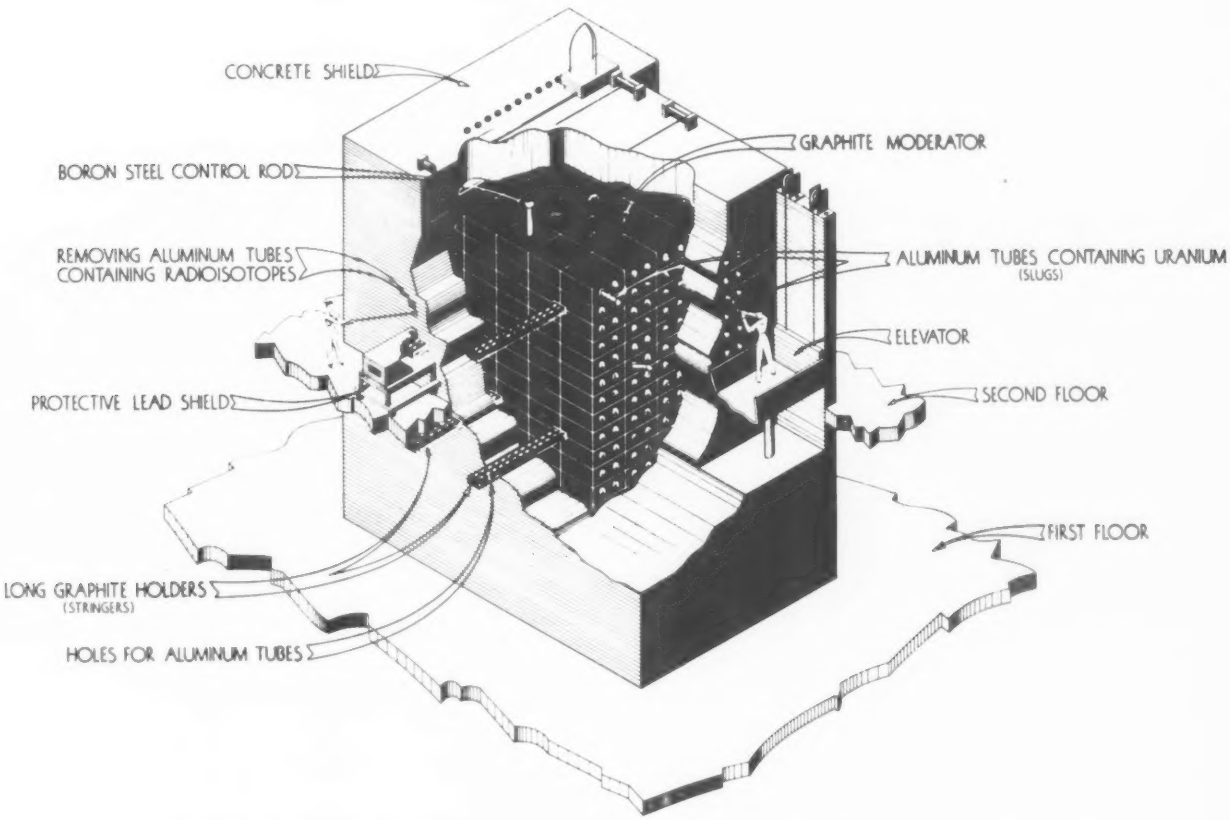
on experience with the five major research reactors and several production reactors in this country, as well as the research reactor in Canada and the two in England. The only other major reactor known to exist in the world is in France.

Protection

To protect personnel from radiation, the pile itself is surrounded by a shield of concrete several feet thick. Routine precautions for protection of personnel engaged in research projects around the reactor include heavy lead shielding, instruments for monitoring radiation levels whenever radioactive material is handled, and use of periscopes and remote controls to manipulate highly contaminated substances. Every person working with the reactor wears devices for measuring his exposure to radiation, no matter how minute. Representatives of Brookhaven's Health Physics Division constantly supervise all precautions against radiation hazards.

The Buildings

The center section of the building housing the reactor is 72 feet high and has two windows of green glass 55 feet tall and 33 feet wide. It is flanked on both sides by wings containing standard laboratories for scientists and technicians. In the specialized Hot Laboratory nearby, the more intensely radioactive products of the pile will be chemically processed. Other structures in the reactor complex include cooling towers and a fan house as well as a 320-foot red-and-white stack, all part of the system for handling the large quantities of air which cool the reactor. Construction cost of the entire complex is approximately $25 million.



NUCLEAR REACTOR——————URANIUM "PILE"

ELEMENTS OF A REACTOR—A cutaway drawing showing the main elements of a reactor of the Brookhaven type. The thick outer shell is a concrete shield to protect personnel from radiation. Into the holes on the right hand face go aluminum tubes containing uranium metal, the fuel which "burns" in the chain reaction taking place in the reactor. Under neutron bombardment, the nucleus (core) of an atom fissions (splits) and releases more neutrons which split other nuclei, and so on, thus producing a chain reaction.

The black cube in the center is made of graphite and is called the moderator. Its function is to slow down neutrons to speeds best suited for splitting nuclei. Another basic element consists of control rods (top). When inserted into the graphite, the rods absorb neutrons and thereby provide a ready means of controlling or stopping the chain reaction.

Into the holes in the long holders or stringers (center) are placed aluminum tubes containing substances which experimenters desire to introduce into the reactor to be made radioactive (able to send off rays or particles). After bombardment by neutrons these substances are changed into isotopes (chemical twins) of the original element in question. These radioisotopes are widely used as a research tool to provide new knowledge in the physical and life sciences, as well as in industry and agriculture.

Because this type of reactor is essentially a pile of graphite containing uranium, it is sometimes called a uranium pile. Supporting facilities indicated here include balconies and elevators for work at various levels, as well as lead shielding to protect personnel inserting or removing samples. Not indicated are the control room, containing devices for measuring and controlling various reactor operations, or the system for cooling the reactor to safe operating level by blowing tons of cooling air per second through it.

AFCA FIELD REPORT

WILMINGTON CHAPTER

By H. J. McCauley, Secretary-Treasurer

With General McAuliffe, Army Chief Chemical Officer, as guest speaker the Wilmington Chapter opened its fall season on September 21 with a dinner meeting at the Du Pont Country Club.

The General spoke on the "Relationship Between the Chemical Corps and the Chemical Industry," describing the part which Chemical troops are taking in Korea and then tracing the Corps' activities back through the supply and procurement phases to the nation's chemical industry. Based on experience derived during World War II, more efficient industrial mobilization procedures have been developed, the General stated. The Chemical Corps' share in the defense effort was described and reliance on industry as the principal supply source was stressed.

The meeting was called to order by Howard S. McQuaid, President of the Wilmington Chapter, who introduced our special guests, among whom were Brig. Gen. Norman Lack, commanding the 2010th Logistical Division; Brig. Gen. John B. Moore, commanding National Guard forces in the Wilmington area; Col. George W. Dunn, commanding the Wilmington Military District; and Mr. Mahlon G. Milliken, AFCA Delegate-At-Large.

Dr. Walter E. Lawson, National President, introduced General McAuliffe to the assembled guests, who rose in a standing ovation.

One hundred eighteen persons attended the dinner including, in addition to AFCA personnel, members of the American Chemical Society, American Institute of Chemical Engineers and others having contacts with various military and naval agencies. After the dinner the Chapter was honored by the presence of more than one hundred officers of the 2010th Logistical Division who arrived in a group for General McAuliffe's speech.

TRAINING BRITISH ARMY OFFICERS

(Continued from Page 30)

this post-war era is indeed in sight of realizing the classical ideal of the good citizen soldier.

Nevertheless, in describing these developments, General Gale was careful to point out that the R.M.A. Sandhurst is not undergoing some revolutionary experiment. What it has done is to move with the times. The Sandhurst of the earlier decades of the present century produced Regular officers who stood the test of two world wars, and enabled Britain to put into the field two considerable armies that were built up from the slenderest of cadres. It was mainly the Sandhurst and the Woolwich-trained officer who provided the basic knowledge in these new formations and communicated to his non-professional comrades something of the spirit of those Service traditions without which no army can hope to touch the heights of military achievement.

It may also be noted that, although Sandhurst today knows no distinction of school or social class, the entrants from Britain's most famous schools still contribute a leavening influence. At the last Entrance Examination nearly one quarter of the successful candidates came from no more than nine "public" schools. Despite all the changes of this modern age, any "aggressor" is likely to find the British soldier to be the same kind of man who successfully withstood the onslaught of two world wars.

paper sculpture by gorecka-ryan

RECORDING APPARATUS

(Continued from Page 12)

varied by changing the air flow thru the bubbler and by changing the dilution factor in the mixing chamber (Figure 2).

The upper flask in Figure 2 served as a premixing chamber and contained the dilution inlet. The lower flask served as a final mixing chamber and contained the air-vapor mixture outlet from which the hot-wire analyzer sampled.

Calibration of the Instrument

The air-vapor mixture was sampled by the analyzer (Vaportester) for various time intervals. In doing so, the vapor passed first through the barium oxide drier. It was found by experimentation that very little paint vapor was removed in this drying process. The vapor then passed through a paper filter to remove any dust particles made airborne in the drying process and finally through the analyzer. The deflections were then noted in the recorder chart (Figure 3).

The bubbler was weighed before and after each run to determine the weight of paint solvent used. Then, knowing the volume of air and the total time of aspiration, the concentration of paint vapor in the mixing chamber was calculated. A calibration curve was established by plotting the chart deflection against the concentrations (Figures 4 and 5). In addition, the total area under the curve obtained from the recorder chart for a particular run was plotted against the corresponding weight of solvent sampled (Figures 6 and 7). This provided a method for obtaining the weight of solvent sampled for a given period of time.

The instrument was calibrated with paint solvents extracted from paints meeting U. S. Army Specification numbers 3-181-A (Type V) and 3-171. It was observed to detect one milligram per liter, equivalent to 175 and 185 parts per million for the solvents obtained from these paints, respectively. Throughout the calibration, with values of one milligram per liter or greater, the maximum error was found to be ± 10-15 percent by weight.

The apparatus could be used for determining most paint spray vapors provided the instrument was calibrated with the corresponding solvents.

At the present time, the field instrument is being used by the Army Industrial Hygiene Laboratory at Army Chemical Center in a survey of paint spray vapor concentrations in spray booths at various Army installations. Initial data indicate concentrations in the order of 1,000 parts per million in poorly ventilated booths.

—NEWS OF THE SERVICES—

Military Gas Mask

An entirely new approved gas mask face piece which provides chin-style, chest-style and hose-mask connections in one unit and retains all the full-vision advantages of their other types has been announced by Acme Protection Equipment Company of Chicago.

According to the announcement, the new face piece, known as No. 6, provides the way to use the same mask for three different services, thus eliminating the need for a different face piece for each service. It will include the regular Acme features of full-vision and dead-air check value and will introduce among other innovations, a new type inhalation-exhalation valve for minimum breathing resistance and the 3-in-1 feature to enable use of chin canister, chest canister and hose connections on the same mask.

Bulletin 504 presenting sectionalized views of the new face piece may be secured by writing Acme Protection Equipment Co., 3037 W. Lake Street, Chicago 12, Ill.

* * *

Bombing Record

Heavy bombs have been safely and accurately dropped for the first time at speeds over 500 miles an hour in test runs with an Air Force North American Aviation B-45 Tornado four-jet bomber. Here a "stick" of 500 pounders drop from the Tornado's bomb bar during the high speed bombing runs.

OFFICER PER DIEM

The Air Force in AFR 173-107, has authorized payment of per diem allowances to Regular and Reserve officers on extended active duty who are ordered to perform temporary duty in connection with the establishment and operation of encampments of the AFR and AF ROTC.

MANUAL

(Continued from Page 11)

ment. Production schedules that are or have been accomplished by management but for which a termination date is not specified will automatically carry a termination date of three years from the date of acceptance. The Munitions Board will automatically cancel tentative schedules of production that are 60 days or more past due for renewal.

It is further noted that the tentative schedules of production required by the procedure of the new manual show phased requirements for a three-year period as opposed to the two-year requirements specified by Annex 47.

Although the new manual does not provide any new procedure for obtaining the security clearance required in the industrial mobilization planning program, there is a hint that some universal procedure may yet be developed.

There is very little change in the actual detailed operating procedures of the program and these are described in Party Two.

NIHON KYOSANTO

(Continued from Page 27)

small platform, gauged the near riot and soon the audience heard his pleasant voice come out in firm tones, "I beg my comrades to cease the attack at once!" This entreaty delighted the audience for it became quiet shortly. The Japanese thought him most polite.

The great *Asahi Shimbun* had huge announcement boards for the posting of election returns. *Kyosanto* sent stooges into the assembled crowds to make sustained applause all day long for the communists and real ovations for the Party's winners. Many Japanese were impressed. in the evening at the end of announcements, most all expected the singing of the Internationale with great flag waving. Such did not occur. This action the Japanese journalists considered clever.

In times of tragedy, all over Japan, in family or group grief, the Communist Party sees to it that its services are available; in fact, the communists entwine themselves with the family or group for they force themselves on the stricken. At the time of the disastrous Fukui earthquake, the communists arrived promptly, and although they did not distribute quantities of needed supplies, their emergency signs would give the impression that they did as they stated that "supplies were the courtesy of the Communist Party."

An electric line's three-car train ran into a siding, an unusual accident. Some eight people were killed, which fact involved 14 families. The company, as is customary in Japan, gave adequate sums for funeral costs, Y19,000 in each case, and a payment of Y125,000 with written promise for an additional sum upon the company's recovery from its war deficit. Communist members of the *Kyoju Saibo* virtually stayed on the *tatami* of the relatives of the deceased, berating the wicked capitalist company and arguing with the relatives that they should demand Y1,000,000 as the settlement figure to be paid at once, and that they would intercede for them to secure it. Innovations of these tactics are widespread. Some millions of Japanese had obtained the impression in the first two years of the Party's existence that *Kyosanto* would be the real guardian for the proletariat. During the last year and a half the millions have grown to know better. Thus ready converts have become disbelievers!

The orderly processes of government and their daily functioning are magnetic to the Party and its members! The orderly processes are an anathema to *Kyosanto* just as they are to other communists in other countries of the world outside the orbit of the Soviets. Their policy to introduce discord, doubt, legal problems from investigations and surprise maneuvers has disrupted the normal functioning of a number of the Japanese local governments—the prefectures, cities, towns, and villages. They have been able "to get at" the local governments more easily than they can the national government in the Diet. In some instances, the officials have been inefficient and even corrupt. In such instances any citizen would have grounds to raise calls for public order. But again the communists have taken the lead in publicizing the facts, and from these they have gone on with half truths to worsen the affairs to involve not only the guilty few, but also others. Unless resignations of officials and actual dissolution of assemblies have taken place. Petitions have been started, even with false signatures, for the recall of both mayors and others. Make work schemes are invented to shunt the normal governmental affairs of office away. Small demonstrations have been staged by communists at the doors of the tax offices, their placards and signs have told the taxpayers not to pay taxes, and the "toilers" themselves have harangued the citizens that payment of the taxes is foolish and that they can avoid collectors if only they will! And from their little tables they have distributed pamphlets of propaganda. The local governments of Japan have never had such sullies and attacks and disturbances, but in their own fashion of group thinking and action, they have evolved on their own some patterns of prevention and solution.

The great majority of Japanese students' lives, men and women, in college or university campuses is one of quietude and seriousness. Not at all that the atmosphere resembles that of the country churchyard of Gray's Elegy. But again, as is true in the case with so many local governmental officials, the average students are curious and without "study" or preparedness can be caught off guard with argumentation. Thus, concessions and deep inroads are gained by *Kyosanto*. The communist students, always "inspired," are always active; they pick out issues and call meetings. That they have been tutored and advised by the Party's committeemen and committee women on creating carefully planned programs is evidenced by the students' tactics. Few non-communists attend these meetings, yet the meetings take place. Some students are apathetic; some are disgusted "to talk so seriously of such matters," and many refused to mix company with a group who aspires to the ideology they "know" to be detrimental to Japan.

Thus, in the first two and one-half years of the Party's activities, the Japanese officials and citizens have had much to see and have had much to learn and now have much to get away *from*.

Japanese Reactions

Great waves of thought in countries come and go. How much of the thought remains to be foundational for a "new" or another era is for the Present to pass on to the Future. A thread of radicalism and communism had been hanging in Japan prior to the signing of the Instruments of Surrender. Following that date, for a period of two and one-half years or so, *Kyosanto* pulled the thread longer. During the past year and one-half the Japanese people have shortened it; in fact, "*Mijikai desu!*" or "It is short!"

In the early months following Japan's defeat, many Japanese homes and family relationships were disorganized. Much property was destroyed. Discomforts were common. Tokyo itself, as the largest city, had 145 square miles of its total of 213, in absolute rubble and ash. Business of all sizes had their difficulties. Financial troubles, as some inflation took place, were intensified. Difficulties were met in reconstruction, rehabilitation, and resettlement. Labor, so long held down, was breathing anew on a very wide scale, talked and acted as never before in Japan.

Into these chaotic conditions came the communists with quick statements that appeared as definite solutions not only to the outside worries of Japanese individuals and families in their finances and economic ills, but also to their inside worries—those of the heart—which so quicken the interests of the Japanese. This latter is important more so than Westerners realize, and quite measurable in Japan.

Suzukikun and Watanabe-kun, as they walked the streets or traveled from prefecture to prefecture with millions of other Japanese, sought answers to many questions and problems before them. Why had the *Gumbatsu* or military clique gotten them into the war? Why had they lost it and disgraced Japan? What had the *kanryo* or bureaucrats to do with these issues? The Japanese Mr. Jones and Mr. Smith had no particular answers which were good at the moment. Moreover, both found

themselves listening intently to younger groups, both women and men, and each knew that 10 years prior he would not have done so. These people in their late twenties and thirties certainly, and their forties, would have to grow up! Suzuki-kun would ask Watanabe-kun, "Why are we doing this today?" and the latter would reply, "Everyone now has an idea; we must hear all we can. Too, they propose many useful thoughts."

With the opening of the free press and radio and the advent of unpoliced meetings and gatherings, many Japanese found themselves speaking their minds as they had done before. They also heard many things aloud which they never could have before. Suzuki-kun would ask, "Shall we go in the parade today?" and Watanabe-kun would say, "If it is a shorter distance to walk, let us do so; the rice cakes and fish with the daikon were about right last time. I was surprised to have so much given. But wasn't more promised?" Suzuki-kun would then state, 'This is my last time today—four parades and speech meetings in these last two months are enough. The singing pleases me; the long walking and running at times do not. Will you carry a flag this time? Not I, my banner last time will do me! Do you feel inspired by the speeches, my friend? I begin to think them very much the same." When the day would be finished Watanabe-kun would then lament, "Why don't we come to our senses? We must take hold of ourselves. I am through parading! The march from the Premier's residence was foolish for me. I was asked by a tired gentleman why was I there, and I asked him the same question. We could not answer each other." And Suzuki-kun would add firmly, "the *Akata* is really *not* Japanese, is it?"

Since the surrender many characteristics of the Japanese have come to light in the early waxing and the now waning of *Kyosanto* in Japan. Many Japanese have a zest and zeal to crusade for some worthy cause, perhaps merely in many instances merely "to go on the march." The vehement speeches made by the communists against the "capitalistic state" and the "overbearing bourgeoise" have given many young Japanese the idea that *Kyosanto* was the Party to join because it, and hence they with it, would "save" millions from being further shackled by capitalists. The speeches and appearances of Shiga and Tokuda excite many Japanese. To a very large number of young Japanese, the fact is most impressive that these two men would take up a cause and then go to prison for so long a time as a political prisoner so as to be able to continue championing that cause. Communism, they "reason," must be a very great ism to induce such martyrdom. And so it went.

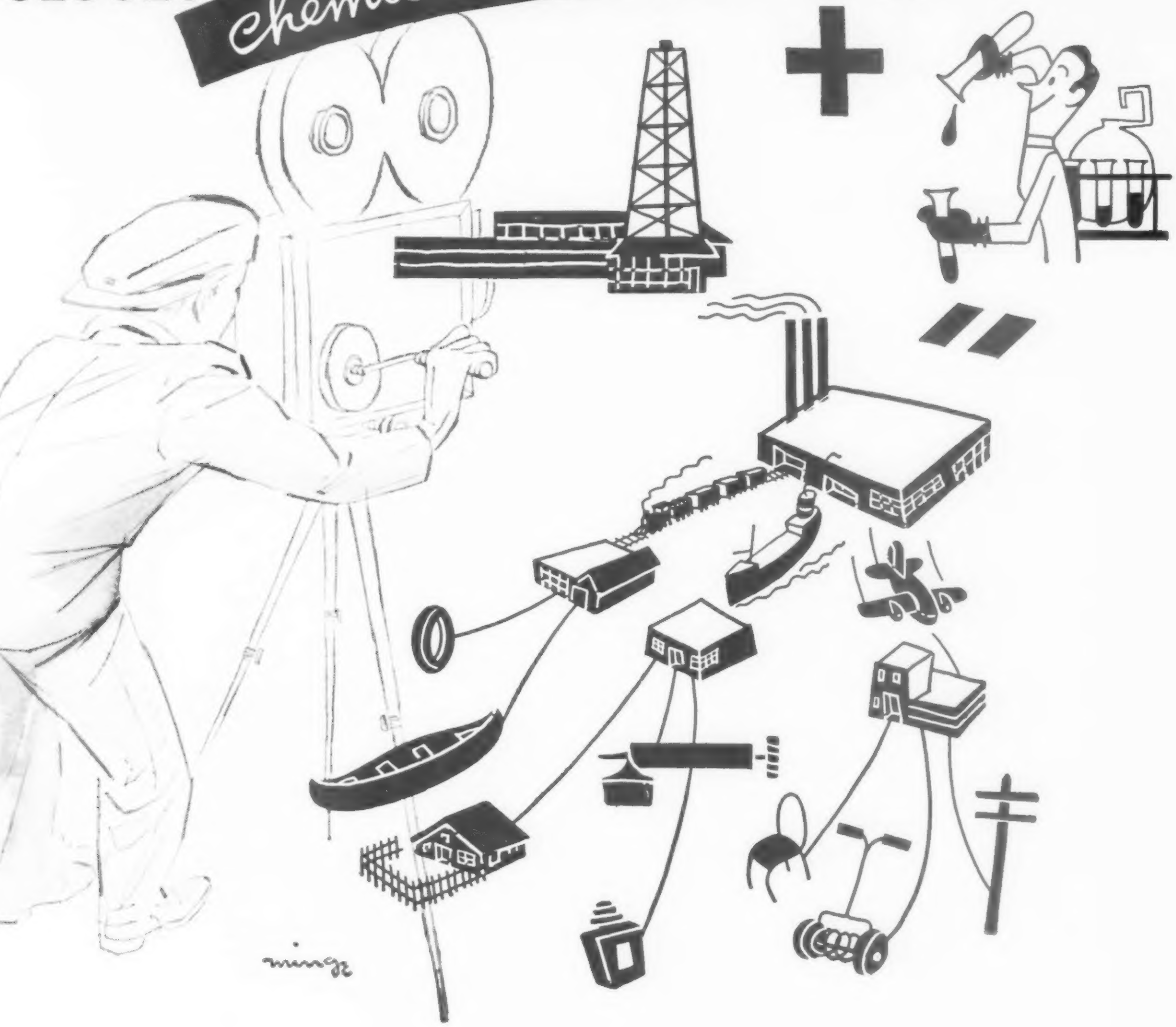
Some deep and noticeable reactions against *Kyosanto* and the communists set in immediately following the third national election. Proof came in the fact that the great majority of local elections seated no communists. Too, the officials had become aware that most communist accusations were mere statements and that when their makers were challenged on the spot, they failed to make sense. When they were taken apart in editorials, they were shown to be hollow. The Japanese as a rule are not prone to air their arguments openly to all and cause disagreeable public contests among individuals or groups. Nevertheless, they have lately, and the communists have been forced to back track. Moreover, communist parades are few now, even for Japan as a whole. Their meetings in public are infrequent and are less in numbers in attendance.

Many of the Japanese repatriates from Siberia, upon reaching Japan, gave their waiting families and relatives the cold shoulder and an actual "bum's rush" in some instances, at the railroad stations in their haste to get to and to "sign in" in the local communist headquarters. They did so to show, supposedly, their loyalty to communism. Yet in doing this, they all offended, angered, and incensed millions of Japanese. The antics of the communist repatriates caused *Kyosanto* to lose face, the exact opposite of what was intended. The communists were unconvincing to millions that their new religion was so potent that the family and loved ones could be pushed aside at first instance after so long a separation.

The other political parties have advanced more pointed programs for their members and the voters than they did previously. In cities, towns and villages, local business groups and youth societies have formed their programs too; all these are organized on democratic principles that the Western democracies well recognize. Thus the long slack in Japanese thinking, programming and action has been taken up immeasurably all over Japan.

ADVERTISING DIRECTORY

CLOSEUP: chemical plant 1950



Ever take a close-up of a modern chemical plant in action . . . from research . . . through production . . . to the time the products are on the market? Let's take a look at Dow—one of the nation's leading chemical producers—by following just one product through the plant:

Dowtherm, for example, is a Dow-developed chemical for process heating. It brings accurate heat control and added safety not found in direct flame heating. Although Dowtherm is widely used already in many factory processes, Dow Technical Service and Research regularly aid in developing new applications for this outstanding Dow-developed heat exchange medium. Products now using Dowtherm in their manufacture include: nylon, plastics, varnish, vegetable shortening, soap, chemicals, asphalt, natural gas and fried noodles.

Once Dowtherm had proved itself in the laboratories, production took over to manufacture this important heat exchange medium for the processing plants of the nation. At the same time, the Dow sales department organized new service and distribution channels and gave special training to production engineers who would handle this new method for process heating.

Dowtherm is only one of over 600 Dow chemicals indispensable to industry and agriculture. Multiply the complexities involved in researching, producing and marketing this one product by several hundred in the Dow line and you will understand why a close-up of a modern chemical company reveals one of the industrial achievements of the twentieth century.

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